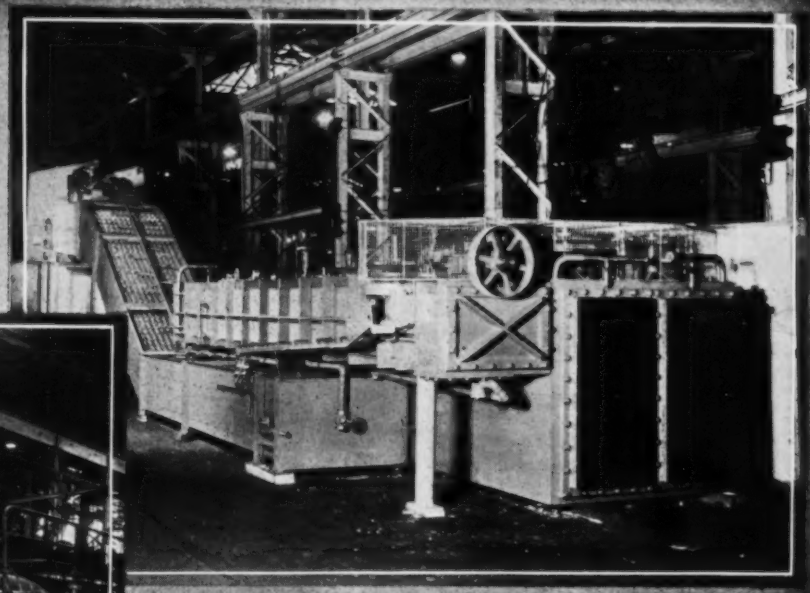
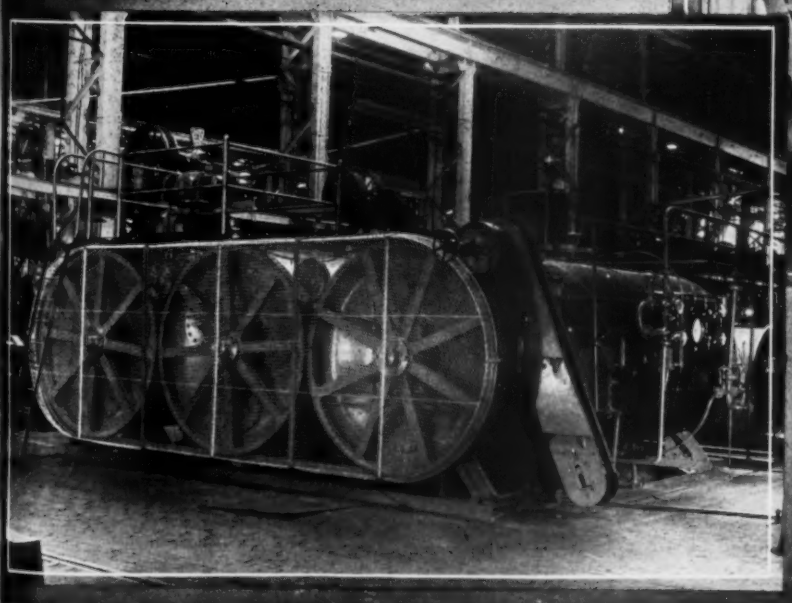
FOOD MANUFACTURE

PUBLISHED BY LEONARD HILL LIMITED, 17, STRATFORD PLACE, LONDON, W.1 OCTOBER 4, 1946

Pressure STERILISING

Two Modern Installations



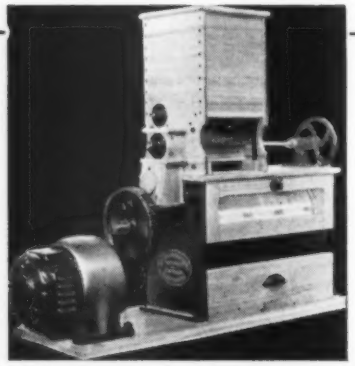


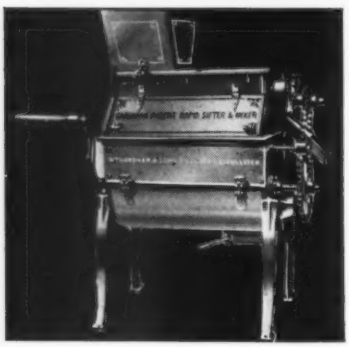
These machines—photographed on test—are typical of the many now on order as a result of the universal adoption of this form of Automatic Steriliser. The upper machine, Non-Agitating type, is for handling meat products; on the left, an Agitating type Steriliser for unsweetened evaporated milk.

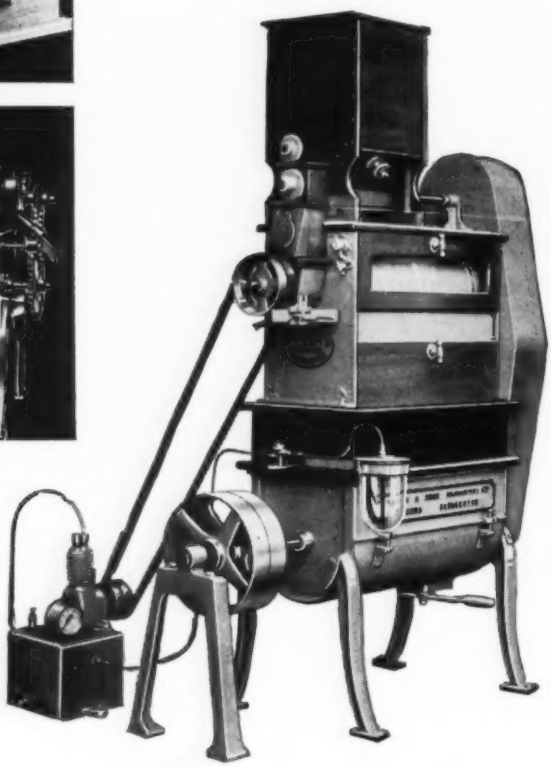
FOOD MACHINERY (M&P) LTD

PARK WORKS MANCHESTER 10

THESE WORKMEN PAY THEIR OWN WAGES







This Gardner combined patent 'Quick-change' Powder Dresser, "Rapid" Mixer and patented Sprayer (illustrated on right) embodies new type air compressor and spray which gives results far surpassing anything previously achieved. Full information about any Gardner machine will be sent on request.

Many customers have told us that Gardner Patent "Rapid" Sifters and Mixers and Powder Dressers soon pay for themselves.

The machines we illustrate will enable you to produce any powdered foodstuff, blended to perfection and free from all oversize particles, grits, lumps, fibre and similar impurities. The products of these machines will be powders of the finest texture, equalling in perfection of mixing, uniformity of colour, flavour or aroma, the best known products of their kind.

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A JOURNAL DEVOTED TO THE PRODUCTION AND MANUFACTURE OF ALL EDIBLE COMMODITIES INVOLVING A PROCESS OF MANUFACTURE.

FOOD MANUFACTURE

Incorporating Canning, Packing and Preserving.

VOLUME . . . XV

NUMBER . . . 10

OCTOBER 4, 1940

PLANT AND EQUIPMENT NUMBER

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Published every month by Leonard Hill Limited, 17, Stratford Place, London, W. 1. Telephone : Mayfair 7383 (Private Branch Exchange). Annual Subscription, 10s. ; Abroad, 12s. 6d.; Single copies, 1s.

The Editor will be glad to consider contributions from those engaged in the Food Industry. Articles intended for publication should be of a practical nature and accompanied by photographs or drawings when possible.

Of Patience, Cakes, and Steel

Demand is there all right! But . . . patience is necessary, whether the matter be cake over which we have no icing, or circumstances over which we have no control . . . such as supplies of stainless steel for food-processing equipment. There's a job to be done, so we thank you for your patience. We are doing everything we can to cut out delivery delays.

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Facing first page of Editorial

FOOD MANUFACTURE

Vol. XV, No. 10 October 4, 1940

The Empire at War

ARRANGEMENTS have been made by the Government of India for an inter-Imperial Conference on war supplies, which is to be held in Delhi this month. The Governments of Australia, New Zealand, South Africa, Hong-Kong, Ceylon and the East African Colonies accepted invitations. This was announced in a communication recently received. Heartening information regarding the Empire war effort is given for each country, and naturally the army, navy and air efforts are the main topics. With regard to food supplies, we are informed that in Canada the wheat carry-over will be 290 million bushels, and the new crop is estimated at between 350 and 400 million bushels. The U.K. Ministry of Food have entered into an agreement with the Canadian Wheat Board to purchase during this cereal year, July, 1940-41, a further 100 million bushels of Canadian wheat. This is the largest purchase ever recorded. Over £4,000,000 worth of Canadian bacon and hams were shipped to the U.K. up to the middle of June.

British Biscuit Exports

We gather that the Board of Trade is encouraging a drive to increase the export trade in British biscuits. The export trade in these before the war was worth £700,000 per annum, but due to the closing of Continental markets, it has dropped to about £500,000. At the same time, Continental biscuit manufacturers can no longer export, and this offers an opportunity of capturing the markets thus left open. British biscuits have always been highly appreciated in the United States, South America, India, and the Far East. In a remote place such as La Paz, Bolivia, English biscuits in sealed tins, in a factory-fresh state, can be seen in the principal grocery stores, and have a ready sale.

The British Industrial Chemist, 1914-1940

The newly elected chairman of the Nottingham Section of the Society of Chemical Industry, Mr. Harold Calam, M.Sc., F.I.C., gave an illuminative survey of the relative position of industrial chemistry in 1914 and the present day. He gave details of the conditions under which chemists faced the 1914-1918 conflict, and in reviewing those of to-day said: "The position in which the British chemist in industry finds itself to-day rests on the success of his efforts during the last war and the developments which have taken place during the intervening period. This period is indeed remarkable for the tenacity with which the British chemical industry has continued its expansion, and by now has rendered the Empire practically independent of foreign chemical training, foreign plant and products. The taunt that there was lack of co-operation between producer and users, between chemists and the medical profession, and so on, cannot now be justified. . . . We have become a nation of chemical industrialists, able to compete successfully against foreign competition." Mr. Calam pointed out that typical large plant installations have been designed by British works and engineers who commenced their careers during or since the last war, and the same thing applies to most of the important food-manufacturing concerns.

A Vitamin B_1 Survey

At the present time, when attention and interest is aroused by the proposed addition of synthetic vitamin B_1 to white bread, the paper by Moran and Booth on an analysis of the vitamin B_1 status of the population of Great Britain is very illuminating. Four dietary surveys were analysed in order to estimate the *per capita* B_1 intake and, in addition, the suitable intake for good health was considered. It is suggested that, for the population as a whole, it is at the rate of 700 I.U. per day, assuming an average energy requirement of 2,810 calories. This figure is made higher because of the greater needs of young children and pregnant and lactating women; excluding these the figure is 420 I.U.

The dietary surveys indicate that about half the population has an inadequate intake of vitamin B_1, and even the other half is not far from the marginal level. It does really appear that everybody in the country could do with a little more B_1 and many of the poorer classes much more.

The surveys considered in the paper are from various sources. One by Lloyd and Orr embraced the whole country; a second was a study of the diets of 205 families in the West Riding of Yorkshire; the third covered 126 Stockton-on-Tees families; and the fourth was the Cathcart and Murray dietary survey on St. Andrews families during spring and winter. Surveys of this type are very difficult to make, and any conclusions drawn from them should be most carefully considered, but taking them as a whole they do appear to provide evidence in support of a greater intake of B_1 all round.

The Bread Controversy Continues

The 1914-18 war saw the beginnings of the white and brown bread controversy. This one has seen the birth of another controversy, which seems destined to be as bitter as its predecessor—the artificial fortification of white bread. The Ministry of Food are undoubtedly on the horns of a dilemma. The work of the nutritional experts referred to above has demonstrated the shortage of vitamin B_1 in the average diet. It has also been proved that a good proportion of the B_1 content of wheat is removed in the production of white flour, the vitamin being removed in the germ and husk. One school of thought headed by the Medical Research Council urges that the vitamin B_1 content of bread should be retained by having wholemeal flour. The agricultural interests in the country, however, oppose this strongly as it would mean a further shrinkage of an already seriously depleted supply of animal feeding stuffs. Mr. Boothby's proposal to add synthetic vitamin B_1 to white flour in quantity equal to that of whole wheat should mean that the nutritional experts would get their full vitamin content, the farmers their cattle food and the people the white bread which they seem to prefer to brown. One would have thought everybody would be satisfied. Nothing of the sort—one party whose spokesman appears to be Dr. E. Graham Little thunders forth in true Johnsonian style, "Why take out what you have to put back in a much more expensive fashion?" Others, such as Professor Harris of Liverpool, strongly deprecate the "doctoring" of bread by a Government department and pour scientific scorn on the

proposed addition of calcium, which, apparently, is liable to cause all manner of kidney and heart troubles unless administered in a manner carefully adjusted for each individual and not in a generalised way. Perhaps, on the whole, it would be wisest to let those who prefer it eat wholemeal bread, for there is plenty available, and leave to those who desire white bread the satisfaction of their palate and the provision of B_1 and calcium from other sources, of which there are many.

The Calcium Problem

We do not wish to harp on this bread question, but it is so important to the health of the community that we feel we can be excused one final word on the proposed addition of calcium, presumably in the form of chalk, to white flour. We wish to make it clear that we are not taking sides in what looks like becoming a first-class controversy, simply desiring to place before our readers both sides of the case. Professor Drummond, scientific adviser to the Ministry of Food, has made a lifelong study of nutritional problems, and has come to the conclusion that the calcium-phosphorus ratio most suitable to good health is impaired by the removal of calcium salts during the milling of white flour. He, therefore, suggests putting them back, and states that in his view this addition would do no harm. Professor Harris of Liverpool, in a letter to the *Lancet*, says, "I should like to contradict most emphatically Professor Drummond's assertion that excess of calcium does no harm. Professor Drummond has no medical experience and, therefore, he cannot have any personal experience of the action of calcium under varied conditions". We do not feel that Professor Harris intended to convey the idea that Professor Drummond does not know what he is talking about, and perhaps the words were badly chosen. On the other hand, Professor Harris is an undoubted authority on calcium balances and his views demand consideration. His view is summed up thus: "Obviously it does not matter whether bread is rich or poor in calcium content. The sole question is whether there is evidence of deficient calcium among the population of the country. It is clear that before an attempt was made to interfere with bread an investigation on these lines should have been undertaken. Furthermore, if a calcium deficiency were established, bread is hardly a suitable vehicle by which to make good this deficiency, for some people eat twenty times more bread than others, and therefore would get twenty times more calcium than others". That is the position—two authorities of recognised repute have diametrically opposite views on this question of calcium addition to bread. So what is the layman's position? Evidently the middle of a sandwich. Harris challenges the Medical Research Council in no uncertain way—"if the Medical Research Council has made such an investigation (on the alleged deficiency of calcium) let them publish the evidence; if they have not made such an enquiry it is not our bread but the Medical Research Council which is in need of urgent reform". To which statement a reply appears to be needed!

Stability of Roasted Coffee

A study of the anti-oxygens produced by roasting coffee is given by Lucius W. Elder, Jr., in *Industrial and Engineering Chemistry*, June, 1940.

The comparison of the oxidation induction period of oil extracted from coffee before and after roasting shows that the roasting process increases the stability of the oil fraction towards the development of rancidity by a factor of approximately 3. The oil from green coffee when subjected to the roasting treatment by itself does not acquire increased stability. The addition to green coffee oil of certain pyrolytic compounds known to exist in roasted coffee, notably pyrrole and aliphatic mercaptans, greatly increases the oil stability. A study of thirty-two additional compounds, including a series of heterocyclic imino compounds, shows that the latter, subject to certain structural and solubility limitations, comprises a new comprehensive group of anti-oxygens. A practical test involving the storage of ground roasted coffee which had been treated with a small amount of pyrrole shows that the oil fraction is definitely stabilised, but resistance to staling is unaffected by such treatment.

The Land Army Protests

Before the war food manufacturers had not properly realised their dependence on food producers. This may not be surprising as for so long their produce had been merely "merchandise" obtained from agents, shippers, importers and merchants. It had become easy to overlook the fact that the farmer is the rock on which the whole edifice of food manufacture and distribution is built. No farmer—no food. Now, for the first time in living memory, we have become very largely dependent on that much despised, even maligned and oft-times forgotten individual, the British farmer. In September of last year, however, he became news. The country as a whole and food manufacturers in particular became aware of him and discovered how necessary it was that he should be protected and encouraged to work hard and cheerfully, and further to sink his capital, or, what is more likely, his credit. To do this he was promised "a reasonable return". What in fact is the position? The new prices for agricultural products tell the tale. Farmers throughout the country are disillusioned.

The *Farmer and Stock-Breeder* recently said on the subject of the new prices: "We strive to avoid language that might appear to be extravagant and only say that in the light of what has gone before, of what has been said and of the pleas and promises that have been made, the announcement is utterly perplexing. This and its unexpectedness may make it astounding, dumbfounding, staggering, or call it what you will".

They continue that, "the promises made to farmers are now given the lie . . . farmers are dumbfounded . . . committees are wavering". They ask, "What does the Ministry of Food really know about agriculture?" They conclude someone has blundered and someone is continuing to blunder.

The acuteness of the situation as viewed by the farmers may be gauged by the fact that the council of the N.F.U. held their September meeting a fortnight earlier than was arranged.

Mr. Howie, speaking at a meeting of the Bucks F.U., said, "Lord Woolton's only concern is about the middleman. The last man he thinks about is the producer. Farmers were disgusted with the treatment they were receiving".

An Irishman's Rise

Mr. A. Dyson Laurie writes in the same journal, "Parliament is to be asked to approve the 'raising' of the standard price for the 1941 oat crop to 12s. 6d. per cwt. Surely an Irishman's rise, since the present 'controlled price' is 14s. 6d. per cwt. The maximum price for oats and barley sold for feeding stuffs grown in 1941 is to be, in fact, *less* than the current prices. Milk prices are to be raised over the 1938-39 level by 7d. and 8d. per gallon. To meet the 10s. weekly increase in farm wages and increased prices for all feeding stuffs, milk prices have already been raised by practically this amount. Is it intended that this new announcement should be misleading in its application?"

Why does the Ministry of Food so dislike pigs? With regard to pig farming, another letter says, "Most pig farmers are astounded at the new prices for bacon".

"The Ministry may easily bring devastation on important sections of British agriculture." So strong are the views held that this is a typical expression.

All sections of our industry of food manufacture are intimately concerned with the farmers—members of the great land army, without whose whole-hearted collaboration the other forces cannot fight.

Army Rations

Sir E. Grigg, Secretary of State for War, when recently asked in the House of Commons whether a greater amount of fresh fruit and vegetables could be included in the new army diet, in order to reduce the number of boils from which the men had been suffering, said that the army ration had been thoroughly investigated by the expert research workers of the Medical Research Council and that it contained an ample supply of vitamins. In particular, the ration of fresh vegetables, consisting of potatoes 12 ounces and other vegetables 6 ounces, was ample. The incidence of diseases of areolar tissue among the troops for the first four months of the war had been one-third of the normal peace-time rate.

This seems satisfactory, but we wonder whether it might not be better to give chapter and verse when such statements are made. We do not for one moment doubt their authenticity, and there may be some reason why actual figures should not be quoted, although we cannot imagine what it could be. The data resulting from research are available and therefore, even in these strenuous times, little extra work is involved. There conceivably may be a large difference between the contents of fresh vegetables and those arriving on the eater's plate.

Commodity Prices

The rise of prices during the twelve months of war, given in *The Times*, is of interest to food manufacturers. The average level of wholesale prices of commodities, as measured by the index number, rose 37·6 per cent. from 114·5 (1913 = 100) on August 30, 1939, to 157·5 on August 30, 1940. In the period the rise in food was 50·8 per cent., from 109·1 to 164·5, and in industrial materials 30·4 per cent., from 117·7 to 153·5. The index for the month just closed compared with July was 3·8 per cent. higher; food recorded a rise of 9·1 per cent. and materials a rise of 0·9 per cent.

The new basis for home-grown grain prices which came into force on August 1, and included considerably higher maximum prices for English wheat, barley, and oats, accounted for the sharp rise of 21·8 per cent. in the cereals group in the past month, compared with July. A higher average price for fish was the outstanding movement in the meat and fish group, and the rise in other food was due to an upward adjustment in the control prices of sugar. In the iron and steel group prices remained unchanged, and in other metals and minerals the only alteration was a moderate decline in standard tin.

A New Defoaming Agent

A paper presented by P. A. Racicot and C. S. Ferguson, at a meeting of the American Chemical Society, deals with the problem of foam prevention in such an analytical procedure as the aeration of various protein foods for the determination of free ammonia as an estimate of the degree of decomposition.

In the analysis of eggs and meats, a layer of paraffin oil on the surface of the liquid is quite efficient, but has very little defoaming properties in the analysis of oysters, clams, and scallops. Capryl alcohol and phenyl ether were tried with unsuccessful results. Besides failing to defoam, these two agents had the added disadvantage of volatilising to a degree sufficient to cause a cloud or fine precipitate with Nessler's reagent. Octyl alcohol (2 ethyl hexanol) was found to prevent foam and had no effect on Nessler's agent, but volatilised within 15 minutes, necessitating frequent watching and attention for a 2-hour run. Experiments with octyl alcohol mixed with various substances resulted successfully with the following mixture: One part of hard paraffin and one part heavy paraffin oil (U.S.P. liquid petrolatum) are heated and thoroughly mixed. To one part of this mixture, add one part by volume of octyl alcohol, mix thoroughly and immediately pour into a glass jar, cover tightly, and allow to cool.

Interruption of Work in Air Raids

The following recommendations by the Sugar Confectionery and Food Preserving (Great Britain) Trade Board to deal with the situation arising from interruption of work by air-raid warnings have been made:

1. Should work time be lost by reason of workers taking shelter after clocking in, the employer will, so far as lies in his power, take steps to ensure workers the opportunity of working the ordinary number of hours of the establishment. This will be done by extension and adjustment of the ordinary working periods. Workers who do not avail themselves of extension of the ordinary working periods will not receive any "making-up" payment.
2. Payment at day rates will be made for time so lost if an employer cannot, within an interval of two weeks from each air-raid warning, provide for such time to be made up.
3. Workers on shifts or on night turns which link up with other shifts are expected to resume work after the "all clear" signal has been received, and to continue until the arrival of the other workers scheduled to carry on the job.
4. Should a warning occur during a week in which the hours actually worked come up to or exceed the normal working week of the establishment, payment at the appropriate rates will be made for the hours worked and no claim for make-up time or for payment in lieu thereof will arise.
5. In the event of workers being advised by the employer or compelled by police regulations to remain in the shelter beyond their normal stopping time only the period up to the normal hour of stopping will count under any of the preceding provisions.
6. If warnings occur which prevent starting at normal times, workers will be admitted within a reasonable time after the "all clear" signal is given.

New Food Control Powers

Power to compel traders to produce their books and accounts to enable full investigation to be made has been given to the new Food Price Investigation Committee for each of the 13 Defence Regions.

The regional addresses of the committees can be obtained at any post-office, and the procedure in regard to uncontrolled foodstuffs will be similar to that followed by the local Price Regulation Committees in respect of other goods of which the prices are not regulated. The reports of the committees will be sent to the Central Price Regulation Committee, who will communicate with the Ministry of Food. The principal foods for which maximum prices have been fixed are: Bacon, ham, butter, eggs, canned salmon, cheese, jam, condensed milk, cream, dried fruits, dripping, herrings, lard, meat, milk, oranges, potatoes, sugar, and tea.

Disappearing Sounds

There was something particularly attractive about the sound of the muffin man's bell, heard in late autumnal and winter evenings. Memories of luscious heaps of round confections, lavishly spread with melting butter; of flickering firelight; of the cheerful family circle; of air unrent by "banshee wails" and direr uproar, at times obtrude with gentle insistence—soon to be banished, it is true, by "realism" and the facing of the job in hand.

The war did not kill the muffin man—he had been moribund for a long time. A modern successor, in the person of a Mr. G. Zeraschi, of Bangor, an ice-cream vendor, using the bell as a propagative medium, was summoned at the local police court for a breach of the defence regulation for the control of noises. His handbell, used for years as a stimulant to the palates of his customers, was considered to be liable to be mistaken for a warning of the approach of enemy aircraft. Mr. Z. had been too busy making ice-cream to have learnt to read or write, and therefore did not know of the Order, but the magistrate was merciful and dismissed the case with payment of costs.

The arrival of the raw materials at the factory.

THE MANUFACTURE OF FEEDING STUFFS FOR LIVESTOCK

A VITAL ITEM IN BRITAIN'S FOOD DEFENCES

The handling of large quantities of different materials, their admixture to form finished products of definite and guaranteed composition, their automatic weighing and the elimination of foreign matter are some of the features described in this article on the feeding stuffs factory of J. and H. Robinson, Ltd.

T. CROSBIE-WALSH, F.I.C.

J. AND H. ROBINSON, LTD., were established as flour and provender millers about 100 years ago, in which time the business has grown from the windmill stage to the present large premises.

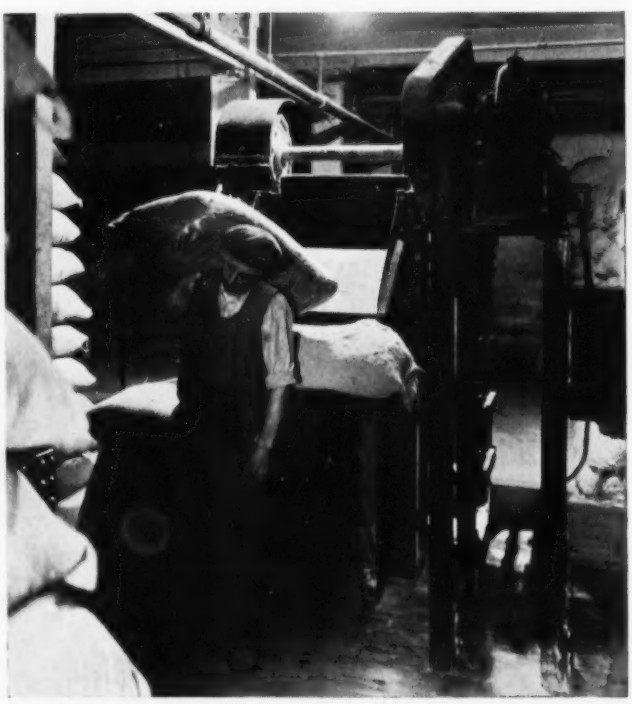
They are now a subsidiary of Messrs. Joseph Rank, Ltd., who took them over some six or seven years ago.

They went into the business of animal foods in a big way about fifteen years ago, and their products are known throughout the country under their celebrated "Blue Cross" brand.

Raw Materials

The raw materials handled are very numerous, and a good idea of the great variety of animal feeding stuffs may be gleaned from some details culled from the Government publication Statutory Rules and Orders, 1940, No. 1119, Emergency Powers (Defence), Food. This deals with the Compound and Mixed Feeding Stuffs (Control) (No. 2) Order, 1940, dated June 29, 1940, and first defines the different terms used in connection with materials and livestock. "Compound or mixed feeding stuff" means any compound cake, compound meal, compound mixture or concentrate which is used as food for livestock. "Feeding stuff" means any substance other than hay or straw which is used for livestock. "Licensed concentrate" means a concentrate which a person is authorised to manufacture for sale or prepare for sale in accordance with the terms of a licence granted under the order. "Livestock" means horses, mules, asses, cattle, sheep, pigs, goats, chickens, fowls, ducks, turkeys, guinea-fowls, geese and carrier pigeons. "Low protein oilseed cake or meal" means an oilseed cake or meal containing less than 22 per cent. of albuminoid. "Protein rich substance" means a substance containing not less than 40 per cent. of albuminoid.

The First Schedule, Part A, gives (1) the name of the compound, or mixed feeding stuff; (2) the purpose for which it is used; (3) conditions as to oil, albuminoid and fibre content; and (4) other conditions as to content. For full details of these the Order itself should be referred to, but a list of the feeding stuffs and the purpose for which they are used, are given in the following table:



The raw materials being taken from mechanical escalator for stacking in warehouse, ready for use.

DESCRIPTION OF COMPOUND OR MIXED FEEDING STUFF.	PURPOSE.
National Cattle Food No. 1.	Dairy cattle, or cattle or sheep fattening ration.
National Cattle Food No. 2.	Ration for grass feeding or fattening.
National Cattle Food No. 3 (Rearing).	Ration for rearing young stock.
National Calf Gruel.	Calf gruel.
National Pig Food No. 1.	Pig nuts or pig meal for sows or weaners.
National Pig Food No. 2.	Pig nuts or pig meal for fattening.
National Poultry Food No. 1 (Summer Laying).	Laying mash or pellets for summer feeding.
National Poultry Food No. 1A (Winter Laying).	Laying mash or pellets for winter feeding.
National Poultry Food No. 2 (Summer growing).	Grower's mash or pellets for summer feeding.
National Poultry Food No. 2A (Winter growing).	Grower's mash or pellets for winter feeding.
National Poultry Food No. 3 (Battery).	Battery mash or pellets.
National Baby Chick Food.	Baby chick mash or pellets.

In the case of the pig and poultry foods precise details are given of constituents, with the proviso that any lack of albuminoid must be made up with vegetable protein. It is also prohibited to use decorticated or undecorticated cotton-seed oil or cake in these foods.

Part B of the Schedule deals with Cereal Mixtures and gives the (1) description of the feeding stuff, (2) conditions as to constituents and (3) conditions as to the percentages of constituents.

The Second Schedule consists of a list of feeding stuffs, other than those mentioned in the First Schedule, in which the following materials are mentioned:

THE SECOND SCHEDULE.

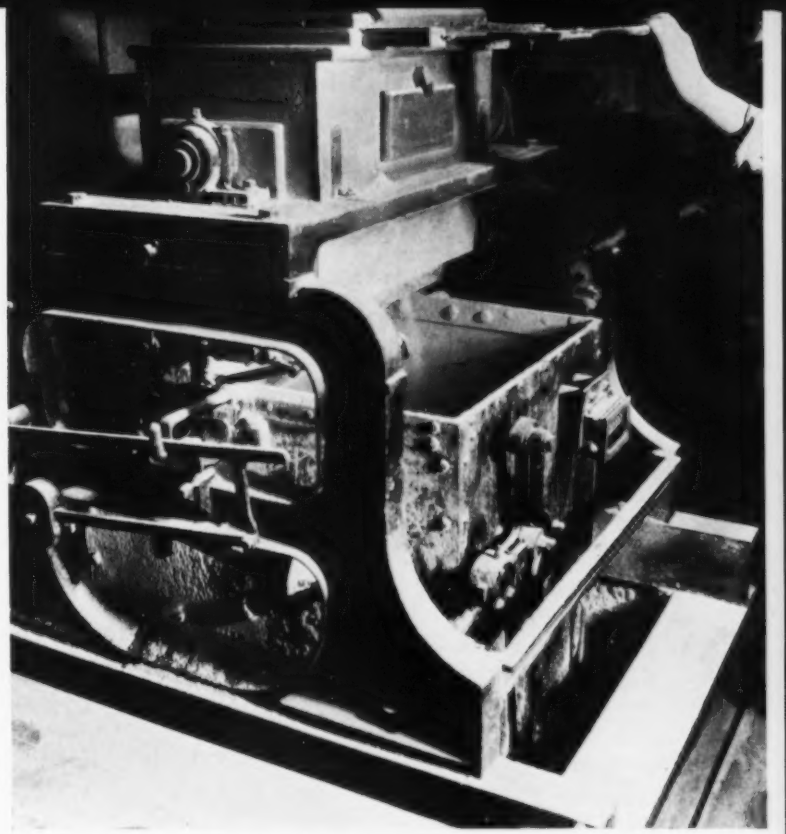
Sugar Cake Molasses.
Dried Grass Meal.
Dried Clover Meal.
Alfalfa Meal.
Lucerne Meal.
Dried Liver Meal.
Feeding Dried Blood.
Dried Yeast.
Cod Liver Oil or other vitamin potent substances.
Wheat Germ.
Licensed Concentrates.
Buckwheat (whole, ground or crushed).
Home Grown Wheat (whole, ground or crushed).
Home Grown Oats (whole, ground or crushed).
Dredge Corn (whole, ground or crushed).
Home Grown Barley (whole, ground or crushed).
Home Grown Peas (whole, ground or crushed).
Malt.
Biscuit Meal.
Mineral Matter.
Spices.
Herbs.
Liquorice Root.
Dried Milk.
Dried Buttermilk.
Whey Powder.
Whey Paste.
Groats.
Ground Tapioca Root (including tapioca flour, manioc meal, mandioca meal, cassava meal and tapioca ampas of feeding quality).
Kapok Seed Cake.
Kapok Cake Meal.
Dari (whole, crushed or ground).
Millet (whole, crushed or ground).
Rye (whole, crushed or ground).

Handling Raw Materials

The raw material is delivered into the factory from barges containing 150 tons and the bags carried by crane to the top of the building. As required, the different materials are emptied into bins which deliver to automatic weighers, which weigh exactly one ton.

Owing to the automatic weighing of raw materials, the correct proportions in the final product are ensured. J. and H. Robinson, Ltd., lay very great stress upon the weighing method as contrasted with volume measuring, owing to the greater accuracy of the former.

From the weighers the material is carried to its appropriate place by four conveyors, thereby enabling four different classes of rations to be handled at the same time.



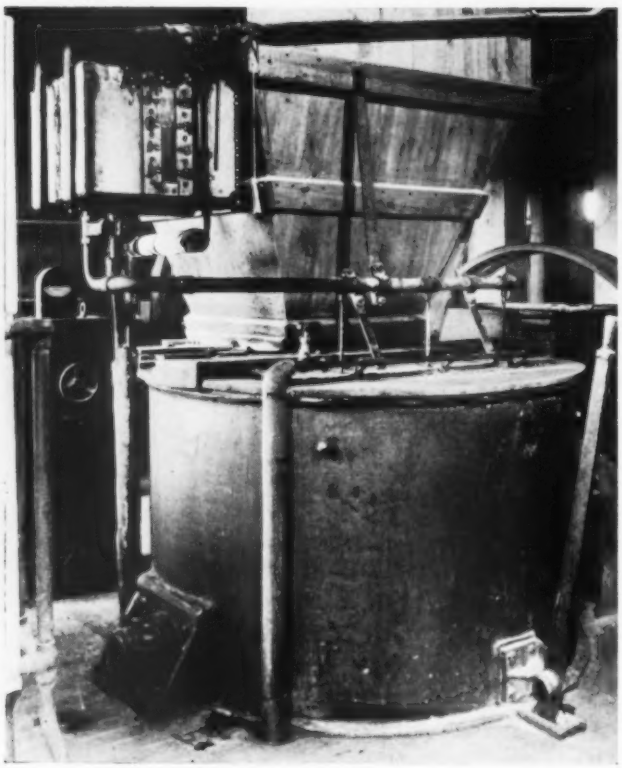
One of the nett weighers which ensure that the correct quantity ingredient goes into the rations.

A matter of the utmost importance is that the finished product as fed to livestock should be free from the slightest trace of extraneous matter, and therefore most elaborate precautions are taken to eliminate such matter. Sifting is carried out both before and after molasses are added, and in the sifting plant are incorporated very powerful double electro-magnets which separate iron and steel fragments, nails and wire.

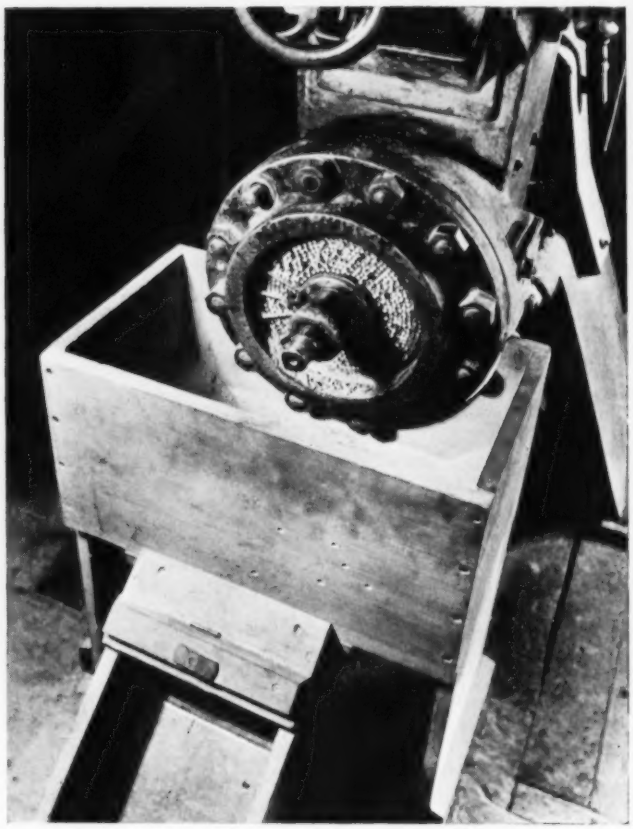
The addition of molasses is effected in the form of a finely atomised spray in one-ton mixers operated by a 50-h.p. motor, which kneads the ingredients to a homogeneous product.

After this mixing the material passes through a final sieve and magnet and then to the cookers, which are steam-jacketed and are also fitted with pipes for injecting live steam into their contents.

Powerful magnets, followed by sieves, for removing metal and other extraneous matter from the raw materials.



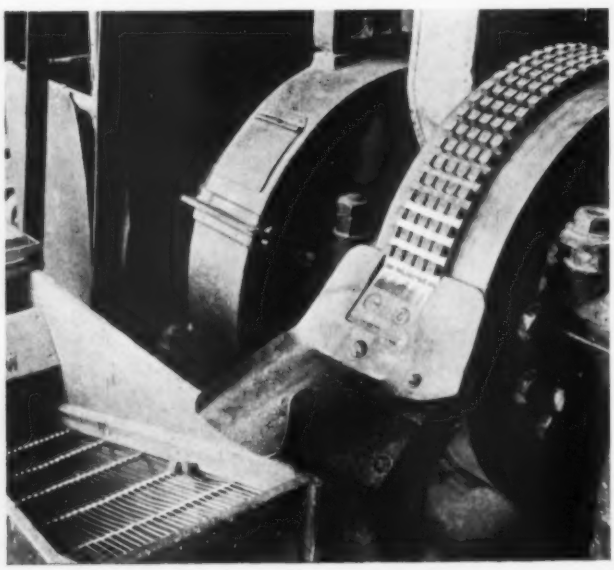
(*Above*) **Perfect mixing of the ingredients, including the necessary amount of molasses, is effected in this one-ton mixer. The molasses are added in the form of a fine spray.**



Cubing machine making chicken pellets.

(*On right, below*) **Sacking and weighing the final product after it has cooled.**

(*Below*) **One of the Orbit cubing machines, each of which has a capacity of 3½ to 4 tons per hour.**



Making the Cubes

The material, now perfectly adjusted as to ingredients, of a proper consistency and homogeneous, is now ready to be made into cubes. High-speed machines turn out $\frac{5}{8}$-inch cubes from the hot material at the rate of $3\frac{1}{2}$ tons per hour per machine.

The cubes fall from the machines into hoppers and are conducted into a large cooler of the bin type, having a capacity of $3\frac{1}{2}$ tons. Air is driven through the cubes until they are quite cool and capable of being handled in the final stages.

In order to separate dust and small particles, still another sifting is carried out, after which the cubes are filled into bags which are weighed direct on the scales.

Pig and Poultry Rations

Pig and poultry rations are prepared in a separate building, and the methods employed are similar to those used in cattle cube manufacture.

The same highly mechanised handling in the transference of the materials from department to department, in the weighing of the different ingredients, and the standardisation of batch quantities undergoing different manipulations, is as notable here as in the other building.

The pig food is made into cubes of the same size as cattle food, but that for poultry is in the form of pellets, which are turned out in very ingenious machines capable of producing them of sizes varying from $\frac{1}{8}$ inch to $\frac{1}{4}$ inch in diameter.

Analytical Control

As may be imagined, analytical control is very important in the preparation of the large number of foods, differing as they do in composition, as do many of the original ingredients.

Each parcel of raw material is examined in the extensive laboratories attached to the factory and none is used until the chemist's report is received.

Strict analytical control is exercised on the finished products, and numerous samples are constantly taken during the day in order to ensure that they conform to the prescribed limits as declared on the bags.

To illustrate the degree of tolerance permitted by the regulations in the analyses of some typical foods, one or two examples may be cited. National Cattle Food No. 1 must contain a minimum of 4 per cent. and a maximum of 6 per cent. oil content; a minimum of $19\frac{1}{2}$ per cent. and a maximum of 21 per cent. albuminoid content. The completed compound must not contain more than 2 per cent. calcium carbonate and 1 per cent. sodium chloride. Such limits are similar in all the foods.

The complexity of some of the foods is shown by the following conditions as to content of National Pig Food No. 1 imposed by the regulations.

This compound shall contain the following:

	Min. Per cent.	*Max.* Per cent.
Maize meal and/or barley meal and or dried potato products	35	—
Wheatfeed (other than bran)	20	—
Wheat	—	20
Oats	—	10
Bran	—	10
Low protein oilseed cake and/or meal	—	20
*Fish and/or animal protein rich substances	5	—
Molasses	—	5
*Sundries, including vitamin potent substances and mineral matter at maker's discretion, provided that the salt content of the compound shall not exceed 0·5 per cent.	—	10

Together with such sufficient amount of *vegetable protein* as will ensure that the albuminoid content of the whole compound is in accordance with the conditions set out in the third column of this Schedule.

SOME SUPPLIERS TO J. & H. ROBINSON, LTD.

Mixers: *Richard Sizer, Ltd.*
Sieves: *Herbert C. Richardson.*
Cake Grinding Machines: *Miracle Mills, Ltd.*
Cubing Machines: *Richard Sizer, Ltd.*
Scales: *W. and T. Avery, Ltd.*
Electric Motors: *Crompton Parkinson, Ltd.; English Electric Co., Ltd.*
Conveyors: *Redler Conveyors, Ltd.*

Quality Control

(*Continued from page 255*)

had an outstanding quality-control organisation concerned with many widely varied products not all of these would be necessary but some of them might be helpful.

Again referring to those who govern costs in food plants, the question is often asked, "Do such things as quality control pay?" I believe those in the plants where real quality control is exercised will answer with an emphatic "Yes!" For the good of food manufacturers, and consumers as well, may we look for more of it in the future.

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FAT AND PROTEIN YIELDS FROM SEED-BEARING CROPS

PARTICULAR attention is being given in Germany to intensive cultivation of plants with a high protein and fat content. The output per acre is a more accurate basis of comparison than the actual percentage content in the plant. The data in the table below are based on recent information:

	Cwts. per Acre. *Protein.*	*Fat.*
Linseed	4·8	3·1
Poppy	4·6	2·2
Hemp	3·0	1·6
Saffron	5·3	3·6
Soya bean	2·9	4·8
White lupin	1·6	5·5
Sunflower	3·1	1·4
Rapeseed	7·2	3·4

It is reported that much more saffron and white lupin is being grown than in the past, the former being exceptionally high in fat and the latter in protein.

THE PURIFICATION OF WATER IN THE FOOD FACTORY

A description of modern methods used in the purification of water for boiler feed and for use in foods

F. J. MATTHEWS, B.Sc.
Author of *Boiler Feed Water Treatment*

WATER is one of the major raw materials of industry, being used both for power development and in actual process operations. Treatment to eliminate undesirable effects of various impurities in natural supplies is necessary on both counts in a large number of industries. At the power plant the use of unsoftened water leads to corrosion and deposition of scale, and the increased plant maintenance charges, loss of output, and loss of fuel and power are particularly undesirable under present national conditions. Process requirements are illustrated in the food industry by the fact that lack of clarity of syrups in fruit canning has been shown to be due in many instances to decomposition of the temporary hardness in the water used. In vegetable canning, too, undue hardness of water has been shown to cause toughness of products, notably with peas and beans. Mineral impurities in natural water supplies also cause trouble in the operation of machinery used in process work, such as refrigerating plant. An efficient water treatment plant can, therefore, make a substantial contribution to the economy of the modern factory, while at the same time the quality of the products is improved and maintained at a more uniform standard. In recent years important developments have taken place in water treatment technology, and it is even possible nowadays to produce economically a treated water comparable with distilled water in quality. A brief survey of modern methods of water treatment, with particular reference to developments of recent years, may therefore be of interest.

Lime-Soda Treatment

The oldest process of water softening is the well-known lime-soda treatment. This is quite a simple treatment, in which hydrated lime and soda ash are mixed and added to the water in such proportions as the mineral content of the water may require. The lime causes precipitation of the carbonates causing temporary hardness in the water, the soda ash (sodium carbonate) throws out the permanent hardness minerals (sulphates), as shown by the following reactions:

Temporary hardness:

$$Ca(HCO_3)_2 + Ca(OH)_2 \longrightarrow 2CaCO_3 + 2H_2O$$
Calcium bicarbonate — *Hydrated lime* — *Calcium carbonate (insoluble precipitate)* — *Water*

$$Mg(HCO_3)_2 + 2Ca(OH)_2 \longrightarrow Mg(OH)_2 + 2CaCO_3 + 2H_2O$$
Magnesium bicarbonate — *Hydrated lime* — *Magnesium hydroxide* — *Calcium carbonate* — *Water*

Insoluble deposits

Permanent hardness:

$$CaSO_4 + Na_2CO_3 \longrightarrow CaCO_3 + Na_2SO_4$$
Calcium sulphate — *Sodium carbonate (soda ash)* — *Calcium carbonate (insoluble precipitate)* — *Sodium sulphate (harmless soluble mineral)*

$$MgSO_4 + Ca(OH)_2 \longrightarrow Mg(OH)_2 + CaSO_4$$
Magnesium sulphate — *Hydrated lime* — *Magnesium hydroxide (insoluble precipitate)* — *Calcium sulphate (to be removed with ash as above)*

$$CaCl_2 + Na_2CO_3 \longrightarrow CaCO_3 + 2NaCl$$
Calcium chloride — *Soda ash* — *Calcium carbonate (deposited)* — *Sodium chloride (common salt—harmless)*

$$MgCl_2 + Ca(OH)_2 \longrightarrow Mg(OH)_2 + CaCl_2$$
Magnesium chloride — *Hydrated lime* — *Magnesium hydroxide (deposited)* — *Calcium chloride (treated with ash as above)*

Other calcium and magnesium impurities are treated in a similar manner.

The precipitates formed in the above reactions are removed by passing the water through wood-wool or quartz-sand filters, so that finally a supply of clear soft water is obtained. The filter may be incorporated in the softening plant, or be provided as a separate unit; nowadays separate pressure filters are commonly installed. There are a number of reputable makers of lime-soda softening plant, the design of which differs in the measurement and addition of the chemical reagents and other devices. The lime and soda ash may be introduced separately or together, a common system being to add them in the form of a mixed cream. Formerly, the equipment for making up reagent supplies and for controlling their addition to the water was located at the top of the plant above the reaction and settling tanks. The most recent plants locate such gear at ground-level, the easier access assisting better control of the treatment. Operation of the reagent mixing and dosing gear is usually effected by the flow of water over some form of water-wheel. The treatment must be controlled on the basis of the water analysis, to ensure the proper proportions of lime and soda being used in accordance with the temporary and permanent hardness present. The treated water is also tested to check the operation of the softener. These periodic analyses for hardness, however, require but little skill, and after a short training can be easily carried out by an intelligent workman.

The cost of lime-soda softening depends upon the relative proportions of temporary and permanent hardness, since the former is more cheaply removed. Both temporary and permanent hardness, however, are removed in the single treatment at the cost of a few pence per thousand gallons—the actual cost naturally depending on the quality of the raw water supply.

After-Precipitation

The softened water from a lime-soda plant usually has a residual hardness of 3° to 4°, and a slight excess alkalinity is left in the water to combat corrosion development. Much trouble is experienced, however, due to the slowness of softening reactions, even if treatment is given "in the hot"; low plant throughput, deposition of precipitates in pipe-lines after the treated water has left the plant, etc., are commonly experienced as a result. This "after-precipitation" is experienced particularly when raw waters contain much magnesium minerals. In addition to imparting cloudiness to syrups in fruit canning and causing other troubles in process operation, power plant is affected in a variety of ways; for instance, "after-precipitation" in steam boilers increases the need for boiler blow-down, with attendant increased fuel losses. These difficulties are overcome by the use of a third reagent in the treatment. This is sodium aluminate, and its application will result in the treated water having a residual hardness of around 1° only, while much more rapid reactions and settling of precipitates are also obtained. These latter features mean that plant capacity is greatly increased. To indicate the reduced maintenance work and increased plant throughput which can be obtained, it may be noted that experience has shown that the need for filter cleaning is halved by the application of aluminate. The very complete reaction with magnesium minerals also results in complete elimination of "after-precipitation" troubles. The reason for the success of the aluminate is that it reacts with calcium and magnesium minerals to form aluminates which are very flocculent and accelerate the settling of precipitates. The quantity of aluminate required is small, not more than ¼ lb. per thousand gallons being sufficient, and since it actually reacts with the calcium and magnesium the amount of lime and soda needed is reduced. Finally, the aluminate can be added quite simply mixed in the other chemicals, no plant alterations therefore being required.

Elimination of Colour

Turbidity due to finely divided suspended matter, or colour imparted by iron compounds or organic matter, is particularly objectionable in water supplies for the food factory, where products may be discoloured. The lime-soda treatment is largely effective in dealing with such problems, especially if aluminate is employed, since the flocculent aluminate precipitate assists separation at the filters. Aluminium sulphate, with lime or soda ash (preferably the latter), may also be used to remove turbidity and discoloration, since a flocculent aluminium hydrate precipitate is produced. This treatment may be adopted if the water is soft and does not justify lime-soda treatment, or as a preliminary to a base-exchange treatment. Soda ash is preferred to lime, since the lime produces calcium sulphate which will harden the water. It is essential that an excess of the alkali be supplied, since aluminium sulphate is a corrosive mineral; effective flocculation also demands an excess of alkali.

Many raw waters contain appreciable amounts of iron in the form of carbonates and other salts. The lime-soda treatment will deal with most of this, or soft ferruginous waters may be handled by aeration to oxidise the iron compounds and permit their removal in conjunction with a coagulant. Certain waters, notably moorland waters, are acid, due to a content of organic "peaty" acids, and these may be quite soft. They require treatment, however, to prevent their corrosive action on pipes, tanks, and metal containers. Plumbo-solvent properties in particular must be countered. Lime-soda treatment is useful for combating acidity, but the most effective reagent against plumbo-solvent properties is sodium silicate. This compound does not affect the hardness of the water, increases the alkalinity, and protects metal surfaces by the formation of a very thin skin of siliceous compound. Silicate is effective in inhibiting action on lead and has also been successful in preventing stored water from acquiring "red water" contamination produced by the oxidation of iron tanks and pipes.

Base-Exchange System

Another method of water treatment, and one which has shown remarkable advances in the past year or two, is the well-known zeolite or base exchange system of softening. The principle of this treatment is that if the raw water is passed through a bed of a synthetic mineral (a complex alumino-silicate) the bases are exchanged. Thus, calcium and magnesium minerals are changed to the corresponding sodium salts, as indicated by the following reactions:

$Ca(HCO_3)_2$ + $Mg(HCO_3)_2$	Na_2Z	→	CaZ + MgZ	$2NaHCO_3$ + $2NaHCO_3$
Calcium magnesium bicarbonates	*Sodium zeolite*		*Calcium magnesium zeolites*	*Sodium bicarbonate (soluble)*
$CaSO_4$ + $MgSO_4$	Na_2Z + Na_2Z	→	CaZ + MgZ	Na_2SO_4 + Na_2SO_4
Calcium magnesium sulphates	*Sodium zeolites*		*Calcium magnesium zeolites*	*Sodium sulphate (soluble)*

Periodically, the zeolite mineral becomes spent, or fully converted to calcium and magnesium zeolite, and it then has to be regenerated by treatment with a brine solution as follows:

CaZ or MgZ +	$2NaCl$	→	Na_2Z	+ $CaCl_2$ or $MgCl_2$
Calcium or magnesium zeolite	*Brine*		*Sodium zeolite*	*Calcium or magnesium chloride*

The treatment can therefore be repeated over and over again.

In the base exchange process, the treated water obtained is of practically zero hardness, no precipitates have to be handled, and furthermore the treatment is effected very simply by passing the raw water through the bed of mineral, no measurement of chemicals being required; variations in water quality are also handled without any trouble. One disadvantage is that the temporary hardness carbonates are converted to sodium bicarbonate (which reverts to carbonate when heated), and with waters of high temporary hardness excessive amounts of carbonate so produced will cause trouble. For instance, the carbon dioxide released by decomposition of the sodium carbonate will cause corrosion; in steam boilers excessive alkali concentrations may cause various troubles, such as embrittlement of the boiler metal. Another point is that the treatment effects no reduction in mineral concentration; it merely changes the character of the minerals and the net salinity of the treated water often shows an increase. By way of contrast, the lime-soda process effects a reduction in the salinity of the water, as much as 25 per cent. reduction often being obtained; the extent of the reduction depends actually upon the proportion of temporary hardness in the water, since it is in reacting with temporary hardness that reduction is effected. It is sometimes said that zeolite treatment labours under a disadvantage in dealing with turbid waters, since suspended impurities clog the zeolite and impair its efficency. This difficulty is overcome, however, by the provision of pressure filters in compact units before the softener, and the operation of a preliminary coagulation process presents no great difficulty if it is required. Sodium zeolites deteriorate on exposure to acid waters, and renewal charges might be expensive in treating such a water. New zeolites have now been developed, however, which are quite stable in the presence of acids. These form one of the most notable advances in water treatment technology in recent years.

Demineralisation of Water

The outstanding importance of these recent developments will be evident when it is said that it is now possible to obtain a treated water comparable in quality with distilled water. Furthermore, the purification can be effected at a lower cost than by distillation, and the necessary equipment is simple to operate. The process has been termed a "demineralisation of water," and although operated on zeolite or base exchange lines it is not entirely a base exchange process. The demineralisation is carried out in two parts, in the first of which the water is passed through a bed of a new synthetic zeolite known as a hydrogen zeolite. The water from this unit contains only acids in place of the usual minerals, and the acids are then removed by passing the water through a bed of an absorbing mineral. The final water then contains practically no impurities at all. Naturally, the process can be operated to effect only partial demineralisation if desired, thus economising in plant and running costs. Both the hydrogen and absorbing minerals can be regenerated periodically, so that repeated operation is obtained.

The hydrogen zeolite mineral has the property of exchanging hydrogen instead of the sodium as effected by the older zeolitic minerals. As a result, all bases are exchanged for hydrogen, including sodium. The water after passage through the hydrogen zeolite thus contains the acids corresponding to each impurity; carbonates produce carbonic acid, sulphates produce sulphuric acid, chlorides produce hydrochloric acid, and so on. When this water is passed through the absorbing mineral the strong or mineral acids are removed by absorption. This leaves the water contaminated with carbonic acid, which is simply a solution of carbon dioxide gas in water and may be removed, if desired, by a system of sprays in an aerating tower or any other simple system of degasification. When the hydrogen zeolite is spent it is regenerated by passing through it a dilute solution of a mineral acid such as sulphuric acid; this contains the hydrogen to put back in the mineral for further operation, removing the calcium, magnesium, sodium, etc., as the corresponding sulphates in the regenerating solution. When the absorbing mineral is fully charged with acids it is regenerated for further work by passing through it a weak solution of some weak alkali such as washing soda, which removes the absorbed acids.

Quality of Water Obtained

The quality of the water produced is indicated by the results obtained with a plant at a distillery, where the water is used in place of distilled water for breaking down gin. The crude water had a hardness of over 24 grains per gallon, with total solid content of nearly 25 grains per gallon; after demineralisation, the treated water contained zero hardness, and only 0·3 grain per gallon total solids.

It is naturally economical to operate water treatment plant to meet requirements of power plant as well as process departments, and in this connection it may be noted that the demineralisation process will give an ideal boiler feed water. It is evident that scale and sludge troubles are avoided, since there are practically no solids left in the water. Alkalinity has given trouble in many cases of ordinary treatment, by building up and causing embrittlement of boiler metal. In the demineralisation process the alkalinity is easily controlled at any point that may be desired.

Minimum Alkalinity saves Power Losses

This minimum alkalinity, combined with negligible solids in the water, means that two major factors in causing boiler priming and wet steam production are eliminated, saving

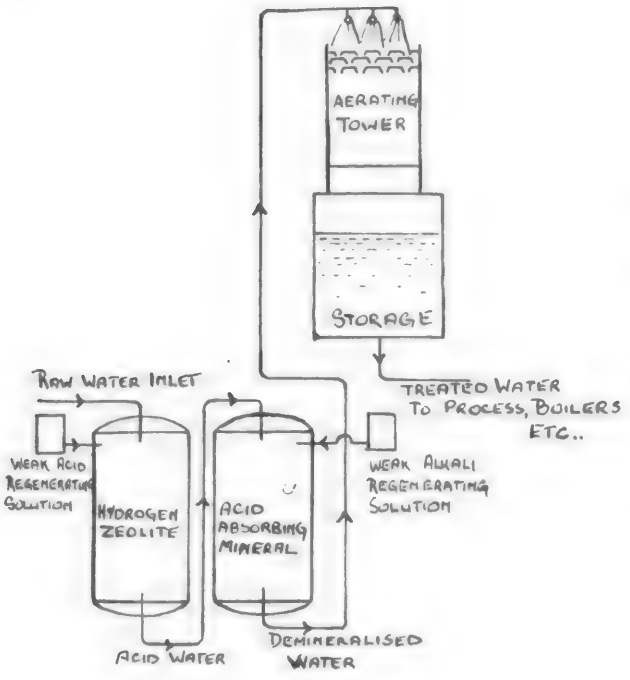


FIG. 1.

power losses and also saving maintenance work caused by deposits formed in engines, pipe lines, etc., from solids carried over with steam. A demineralising plant providing make-up water for some 450-lb. pressure boilers handles 72,000 gallons per day in place of the evaporators formerly operated. The crude water has a total solid content of 47 grains per gallon and a hardness of 23·5 grains per gallon; the final treated water contains only 1·1 grain per gallon total solids, with a total hardness of zero. Ordinary industrial low-pressure boilers will also benefit from such a pure feed supply, as illustrated by the case of a works plant operating at 180-lb. pressure. The crude supply in this instance contains a good deal of sodium bicarbonate, which no chemical process is capable of removing. It is undesirable in boiler feed, since it decomposes in the boilers to produce carbon dioxide gas (which corrodes boilers and auxiliary equipment) and caustic soda (which is likely to concentrate and lead to embrittlement of the metal). The demineralisation plant in this works is operated to effect only partial purification. The total solids are reduced from about 24 grains per gallon to 3 grains per gallon; the sodium bicarbonate from 18 to 0·1 grain per gallon; and the total hardness from 3 to 0·3 grain per gallon. Demineralising plant lay-out, either for boiler feed or process water treatment, is illustrated in Fig. 1.

The ability of this process completely to remove sodium bicarbonate is an important advantage. Waters containing considerable amounts of this salt are frequently obtained from wells, and formerly the only thing to do was to treat by a reversal of the lime-soda process—that is, supply calcium chloride or sulphate to react with the sodium bicarbonate; but even then the treated water was left with an equivalent amount of sodium sulphate. The new process provides an easy means of removing the impurity completely; plant is compact and simply operated also.

Combination with Sodium Zeolite Unit

The hydrogen zeolite unit may be operated alone if required, but it is usual to couple an ordinary sodium zeolite unit with it to enable blending of the two treated waters to effect neutralisation of the free acids from the hydrogen zeolite unit. The sodium unit, of course, will produce sodium carbonate by softening the temporary hardness; this sodium carbonate can be used to neutralise the free mineral acids produced by the hydrogen unit. Alternatively, a weak solution of soda may be added to the hydrogen effluent water to effect the neutralisation. This hydrogen zeolite process will not effect complete demineralisation, but all carbonates and temporary hardness can be completely removed; sufficient neutralisation is carried out to deal only with the mineral acids, and aeration or other means will remove the dissolved carbon dioxide produced from the carbonates. Obviously, too, by controlling the neutralisation or blending, the alkalinity of the treated water can be fixed at any desired point. As an alternative to the complete or partial demineralisation process, the hydrogen zeolite process may therefore be all that is required, depending on factory conditions and the nature of water supplies.

Sterilisation Processes

Another and important aspect of water treatment is its sterilisation. Cholera germs, and germs of various other diseases, are water-borne, and consequently it is imperative to ensure that water used in food manufacture shall have been given suitable treatment to cause the destruction of disease germs. Products such as condensed milk cannot be stored safely unless sterile conditions have been imposed. Products intended for export, too, will be exposed to tropical temperatures which will stimulate bacterial activity to a greater extent than the home climate, again calling for effective sterilisation. An illustration of the latter type of problem is provided by an instance where a large number of condensed milk tins were found to have seriously deteriorated on storage after shipment abroad. It was found on examination that the tropical temperatures had developed the spores of certain organisms such as *Staphylococcus* and *B. megatherium* which had been introduced through the water supply during manufacture in this country. The difficulty was completely overcome by sterilisation of the water supply.

Use of Chlorine

The best method of sterilising water supplies is the admission of chlorine, either alone or in conjunction with ammonia, to the water. Chlorine gas is quite readily introduced to the water by means of a vacuum chlorinator. Essentially, a vacuum is produced by an auxiliary water supply through an injector, and chlorine is thus drawn into the injector to become mixed with the auxiliary water supply. This forms a chlorine solution which is then mixed with the main water supply. A number of outfits operating on these lines are on the market. Although the chlorine is dangerous, and is taken from cylinders of the liquefied gas, various safety arrangements are incorporated in the equipment. For one thing, the chlorine is always under a vacuum and therefore cannot leak out to poison surroundings. Also, arrangements are made so that if the water supply to the apparatus stops for any reason, the feed of chlorine also stops automatically. The amount of chlorine which is required naturally depends upon the amount of contamination, the time of year being a factor in this direction, as shown in the table below. Usually, however, if an adequate contact period is allowed, less than one part chlorine per million parts of water will completely destroy bacteria, without imparting undesirable tastes to the water. For certain classes of water subject to sudden contamination, superchlorination is practised. This is the application of several p.p.m. chlorine, the water subsequently being dechlorinated with agents such as active carbon to remove the taste. This method is useful for getting rid of undesirable tastes in the raw water also.

Ammonia-Chlorine Treatment

An improvement on the simple chlorination process is the more recent ammonia-chlorine treatment. This method is particularly good for dealing with waters containing small amounts of substances which themselves form tastes by reaction with the chlorine. According to the proportions of ammonia to chlorine supplied, chloramine or dichloramine is formed; these chloramines are more stable than dilute solutions of chlorine alone, and consequently the treatment results in retention of the germicidal power for longer periods. This is particularly important for storage of foodstuffs in hot climates. The tinned milk trouble noted above was solved by adopting the ammonia-chlorine sterilisation method. The much greater bactericidal power of this method as compared with the straight chlorination is brought out in Table A.

It is therefore clear that addition of ammonia intensifies the attack on bacteria. The dosage is given by means of plants similar to that used for chlorination alone. (In the above table *B. coli* were the germs counted, because destruction of *B. coli* is a standard of sterilisation; these are the more resistant bac-

teria, and their destruction implies the accompanying destruction of all microbes causing water-borne diseases.)

TABLE A.

MONTH.	*B. COLI.*	CHLORINE ALONE		AMMONIA CHLORINE TREATMENT		
	In raw water per 100 ml.	*Chlorine p.p.m.*	*B. coli per 100 ml.*	*Chlorine p.p.m.*	*Ammonia p.p.m.*	*B. coli per 100 ml.*
July ..	237	0.7 – 0.8	44.4	0.51	0.08	0.08
August ..	165	0.7 – 0.8	28.0	0.51	0.10	0.08
September..	55	0.7 – 0.8	15.2	0.50	0.09	0.08
October ..	31	0.7 – 0.8	1.1	0.42	0.08	0.15

Cooling Equipment

Cooling operations play a part in many industries. The modern creamery or milk factory with refrigeration plant and milk coolers illustrates this feature. At the power plant efficient cooling of condensers is vital for fuel economy and over-all plant efficiency—incidentally an important feature in these times of efforts to conserve national resources. The deposition of scale on cooling surfaces is a widespread source of trouble and expense, being experienced on all kinds of cooling equipment. A new, cheap, and efficient method of preventing the deposition has been developed in the past year or so, and has already been widely applied with marked success. In addition to saving maintenance work and improving the efficiency of cooling operations, substantial economies in water consumption have been achieved in a number of instances. This is a valuable feature in view of the enormous quantities of cooling water frequently required by modern factories.

Scale formation on cooling surfaces is invariably due to the temporary or carbonate hardness of the water; the bicarbonates are broken down under the comparatively moderate heating to produce insoluble carbonates. Sulphates rarely form more than a few per cent. of the scale since they are not so affected at normal cooling system temperatures. Consequently, the major portion of scales on cooling surfaces consists of calcium and magnesium carbonates, as shown by the following actual examples:

	Per Cent. I.	*Per Cent. II.*
Calcium carbonate	80·6	92·7
Magnesium carbonate	5·3	—
Sulphates	2·0	4·2
Iron oxide	4·1	1·8
Silica	0·4	0·3
Organic matter	7·6	1·0

The organic matter is due to fouling of the water with vegetable organisms, etc., and consequently may vary considerably.

Action of Sodium Metaphosphate

This type of scale can be prevented by the addition of sodium metaphosphate to the cooling water. This reagent, even in the small amount of 2 parts per million (which is 2 lb. per 100,000 gallons of cooling water), has the remarkable property of delaying the deposition of carbonates until much higher concentrations are reached. The extent to which this action takes place is illustrated by the graphs given in Figs. 2 and 3, which compare the deposition from treated and untreated water after exposure to the temperature concerned for one hour; the treated water received an addition of only 2 p.p.m. metaphosphate. It will be observed that even at temperatures approaching boiling point (actually 176° F.) the very small treatment reduced deposition even from very hard waters.

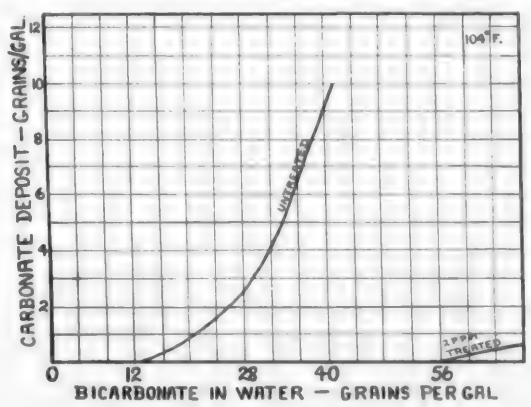


FIG. 2.

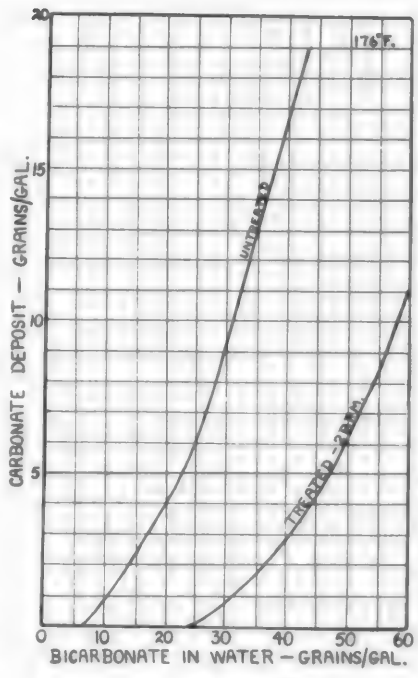


FIG. 3.

This graph and the preceding one illustrate the delaying action, until high concentrations are reached, of sodium metaphosphate on certain waters.

One of the most useful features of the treatment is the fact that a treatment plant is not required, and it is sufficient to add metaphosphate solution simply as a gravity feed from a stock tank. Even an accurate proportioning gear is not required, since the reagent is effective over a range of concentration. Naturally, the amount of metaphosphate required depends upon conditions such as the hardness of the water, whether cooling water is recirculated, etc. Where recirculation is practised, it is usual to purge a proportion periodically from the system in order to control the concentration of bicarbonate and so limit the amount of treatment. In all cases, however, it is unnecessary to use more than 2 p.p.m. metaphosphate, and frequently conditions can be arranged to allow a lower treatment to be satisfactory.

Another useful feature of the treatment is the ability of the reagent to remove existing scale deposits gradually. Sometimes a higher initial treatment than the 2 p.p.m. is given to the water in order to accelerate this cleaning up of the cooling surfaces. But this increase is purely temporary, and treatment can be reduced in a short while to the limits mentioned.

The treatment has been widely and successfully applied, and only a few examples can be given in the space available. Dosage of around 1 p.p.m. has been given to municipal water supplies to prevent delayed precipitation of carbonate in distribution pipe lines, etc.; in this case the metaphosphate is prepared from high-grade phosphoric acid so that the potability of the water remains unaffected. At a distillery, condensers were kept clean with a treatment of 1¾ p.p.m., and the improved heat transfer with the clean surfaces led to a reduction of 40 per cent. in the cooling water consumption. Other large plants have saved thousands of pounds annually by eliminating descaling operations and reducing cooling water demands. In one case the annual saving was around £2,000; in another, several thousand pounds plus a reduction of one-third in water requirements—in these cases treatments were 1½ and 2 p.p.m. respectively. In conclusion, reference may be made to indirect savings. These may include improved operation of equipment and machines, and in the latter category compressors, Diesel and gas engines, etc., should be overlooked as they may also receive improved cooling from water treated this way. Furthermore, it may be possible to economise on water itself apart from actual reduction in consumption. With the treatment, an alternative cooling supply may be usable, whereas formerly its mineral content caused too much trouble. This alternative and more impure cooling water will probably be considerably cheaper.

WATER SOFTENING

PLANT AND EQUIPMENT

Zeolite

ZEOLITE is produced by a patented freezing process in which the sodium-alumino-silicate gel formed in the early process of manufacture is dehydrated by freezing the mass. The result is that individual crystals are formed in a block of ice, and these crystals are subjected to increasing pressure during the freezing process. The rate and depth of freezing controls the final size and proportion of the granules so that, upon thawing the blocks of ice, the zeolite is in a granular form and, what is most important, the granules are of uniform density throughout the mass and of uniform cubiform shape.

This freezing process gives to the zeolite the further advantage of resistance to attrition and resistance to attack by CO_2, and also enables the zeolite to resist the solvent action of waters that may be low in dissolved silica.

This zeolite, made by the Burgess Zeolite Co., Ltd., is guaranteed by them for three years, and they claim that users of water softeners can obtain a greater output of softened water by the use of Burgess zeolite to refill their softeners.

Sodium Aluminate

Where large quantities of water are used, numerous problems connected with water treatment are liable to arise. The use of sodium aluminate has been found to improve the efficiency of the lime-soda water-softening process, and this substance can also be used to improve the performance of plants removing colour from water. In conjunction with other alkalies it can be used for the prevention of scale in boilers where no water-softening plant is installed.

Claiming to be specialists in the use of sodium aluminate for improving water treatment, Alfloc, Ltd., a subsidiary company of Imperial Chemical Industries, Ltd., state that they have been responsible to a large extent for the development of the use of this chemical in Great Britain and throughout the British Empire.

Pre-treated Boiler Feed Water

The main advantage of softeners for industrial use over those supplied for domestic purposes is, of course, the higher rate of flow provision under continuous softening load.

If boilers are going to become difficult to obtain and heavier duties are going to be put on existing plants, attention will become attracted automatically to securing the higher efficiency offered by properly softened boiler feed. It is in the interest of everyone that saving in fuel should be made, and it is equally important at the present time that boilers should not only last longer, but that higher efficiency should be obtainable. If boilers are to be kept going they should be fed with properly pre-treated feed.

Lime-Free Water and General Services, Ltd., supply water softeners of all capacities, enabling the water to be softened before it enters the boiler, so that the maximum amount of efficiency may be obtained from the plant.

Removal of scale from condenser tubes by Threshold Treatment with Calgon.

The Use of Phosphates

The use of phosphates for the conditioning of boiler feed water, in order to prevent the formation of scale on the heating surfaces, is now well established and can be regarded as standard practice in many boiler plants throughout the world. Phosphate is stable at the highest boiler pressures. The addition of a suitable phosphate to the feed water causes the residual calcium to be precipitated as a soft sludge of calcium phosphate in the boiler, which can easily be removed in the routine blow-down, instead of a hard sulphate scale on the heating surfaces.

Sodium metaphosphate—known commercially as Calgon—has the interesting property of holding calcium in a soluble form and keeping the feed lines and economisers free from scale deposits.

Keith Piercy, Ltd., claim that Calgon in the proportion of 2 parts per 1,000,000 will prevent the formation of calcium carbonate scale when the water is heated to temperatures less than boiling point. It is not known with certainty why Calgon exerts this effect, but one suggested explanation is that, as soon as precipitation of calcium carbonate commences, metaphosphate is adsorbed on the minute crystals and prevents them from uniting to form the visible crystals of a precipitate or scale.

Iron Removal Treatment

The presence of iron in solution in ground water in amounts greater than 0·50 part per 1,000,000 is objectionable to the consumer. Many industries cannot tolerate even a small amount of iron in their water supplies. A feature of some supplies is the presence of iron bacteria which use iron as food and, after obtaining nourishment from it, precipitate it as iron oxide.

The removal of iron from water is essentially a reversal of the process which causes its appearance. The iron must be reconverted to the insoluble or oxide form, after which it may be filtered from the water. There are several ways of doing this—aeration, contact, chemical treatment, sedimentation, filtration, etc. The Layne system used by Layne Well System, Ltd., is operated on the principle of aeration combined with contact treatment, followed by filtration.

For a plant having a daily capacity of 1,000,000 gallons delivered at, say, 35 lbs. pressure, the aeration is made at the rate of approximately 40 cubic feet per minute, the rate of aeration varying with the iron content of the water. The rate of backwash is usually three times that of the rate of filtration for a period of approximately 10 minutes, and the quantity of water required naturally depends on the iron content of the water treated, as does the rate of filtration. Usually for water with an iron content of 1 to 2 p.p.m. the rate of filtration will be 4 g.p.m. per sq. ft. of filter.

Distilled Water

It is no exaggeration to say that with the present available range of plants almost any water supply can now be treated and rendered suitable for every industrial purpose.

One method of removing hardness salts from a water supply is by the use of the zeolite water softener. Another process is the lime-soda—or precipitation—method.

With many industries it is desirable to have available a water supply of zero hardness with a definitely controlled alkalinity. The Permutit Co., Ltd., claim that their latest "Permutit" hydrogen ion plant, working in conjunction with a standard sodium base-exchange softener, will fulfil these requirements. For commercially distilled water they claim that the "Permutit" Deminrolit process can be employed with every success. This method, they state, is simple and very economical so far as running costs are concerned. The chemicals take up little space in storage and ensure continuity of supplies of commercially distilled water, even under the most adverse conditions.

Kenzelite

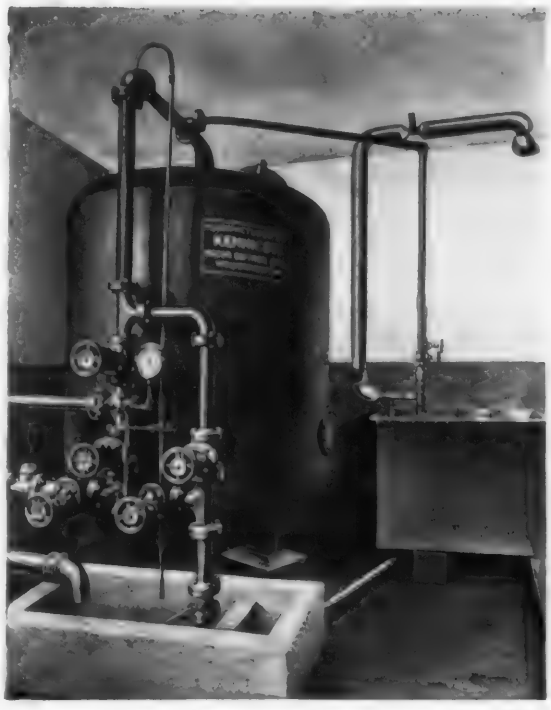
Numbers of food factories have water-treatment plant for boilers, but a point worth consideration is the installation of a water-treatment plant for use in canning. With this type of base-exchange water softener no sludge is produced, and there are no chemicals required other than common salt, which is used for regenerating purposes.

John Thompson (Kennicott Water Softeners), Ltd., manufacture a material known as Kenzelite, which they claim has the property of combining with all lime and magnesia contained in the water, thus reducing the hardness to zero. It is a natural mineral with a high exchange capacity, and has an extraordinarily long life. Common salt is all that is required to regenerate the Kenzelite when it becomes exhausted.

Nat-Rol

The process of water softening greatly improves the water supply for cooking and canning purposes and soon repays the purchaser the cost of the installation by the saving in such materials as soap, soda, fuel, etc. Vegetables and fruit treated and canned with soft water tend to retain a better flavour and colour.

Watson's Water Softeners, Ltd., manufacture their own base-exchange softening material, known under the name of "Nat-Rol", which they guarantee against depreciation for five years. The softener itself is very compact—a point worth considering when space for housing such a plant is limited.



A Kennicott Water Softening Installation.

Freeze-Formed Material

A large number of water-softening plants are constructed on the base-exchange system with varying adaptations. The softening material employed by Economic Water Softeners, Ltd., is a synthetic substance which has been "freeze-formed". This company claim that the process of crystallising the gel by freezing instead of roasting has numerous advantages, the chief of which is the fact that freeze-formed particles under the periscope show great uniformity in shape, this having a bearing on the subsequent performance and life of the softening material when in action.

The brine tanks are made of mild steel, heavily galvanised and bitumen lined. The brine collection system at the bottom of the tank is embedded in two grades of gravel so that all brine is filtered before it enters the water-softening plant. Provision has been made to reverse flush the filter bed in the brine tank so that only pure brine is ever admitted into the water softener.

Useful additions in cases where the brine tank is on another floor or in another part of the building are flow gauges to show when the plant is reverse flushing at the correct speed, and depth gauges to show when the brine tank is full or empty.

Detergents

There are four points worthy of note in the washing and cleansing of bottles, tins and utensils used in the food industry. First, the process should remove the whole of the residue of the previous contents and any foreign matter picked up by use. Secondly, the bottle must be entirely free from any trace of the cleanser employed, and must be neither acid nor alkaline in reaction. Thirdly, at the end of the process the bottle or container must be of a satisfactory standard of sterility. And, lastly, the cleansing process must not have any action on the material of which the vessel is made.

The British Hydrological Corporation supply compounds adjusted for specific requirements. It would obviously be undesirable to use a compound for washing biscuit tins which might be used for washing bottles; and, again, the compound must be adjusted according to the residue present in the bottle, which might be milk, jam, beer, etc. Still further adjustment of the compound is made in relation to the nature of the water supply available. For instance, it would be necessary with hard waters to introduce into the compound a chemical which would sequestrate the calcium salts present and so prevent film on the bottles and scale on the machine.

These products are marketed under the title B.H.C. Colloidal Cleaners.

QUALITY CONTROL

ITS APPLICATION AND SIGNIFICANCE IN THE FOOD INDUSTRY

A review from an American standpoint

PROFESSOR BERNARD E. PROCTOR
Massachusetts Institute of Technology

IT IS obvious to the most casual consumers and purchasers of foods that the quality of American foodstuffs which reach our markets to-day is much higher than was the case even a decade ago. The producers, shippers, and manufacturers who have not kept pace in improving their standards of quality in every possible manner are running a hopeless race, because this movement towards better quality and more uniform food products is bound to continue.

The consuming public has enthusiastically approved and accepted these improvements in food quality and does not knowingly purchase inferior products for the family table, despite the fact that higher quality may sometimes cause a slight increase in expense.

New Varieties

With fresh produce this trend has resulted in the development of new varieties which are more acceptable in appearance, flavour, colour, or texture to the ultimate consumer, and other varieties more suitable to the special needs of the canners, freezers, and manufacturers of food products.

In many food industries it has meant using the same raw materials which have been harvested in the same general manner for centuries, but devising new processes and combinations of processes which result in more attractive, more palatable, more nutritious, or more conveniently prepared foods for home use.

Quality control has a vastly different meaning to various people in the food industry, and sometimes even in different departments of a single food-manufacturing plant. To a few it means making the highest possible quality of product. The very highest quality of any commodity, however, is available only in small proportions, sometimes not in sufficient volume to justify large-scale operations because of the lack of raw materials of that character. The consumers for such super-quality products are also restricted to a limited percentage of the buying public.

Uniformity Necessary

To the food industry in general, quality control signifies the setting of the highest possible quality standards which one may hope to maintain consistently year in and year out, but maintaining rigidly and within definitely restricted limits the quality standards which have been set by the particular organisation. This involves, above all, the uniformity of the product as it meets the eye of the potential consumer and his gustatory satisfaction when it is consumed, even though the raw materials may differ tremendously, as crops do from season to season.

When appearance changes, the consumer becomes immediately suspicious and reacts like the man who was served two fried eggs, each of a different yolk colour. Despite their fine quality he rejected both, telling the waiter "Something must be wrong with one of them and I might not pick the right one".

Regardless of one's personal definition of quality control, there is a recognised need for all those means which are available for the constant checking and maintenance of such standards as have been set within any food factory for its products, and for trained persons to use those methods which are applicable.

Establishing Standards

The standards themselves should be decided by the administrative group of any company in consultation with their quality-control group and the production group, but the assumed functioning of quality control may result in a false sense of security unless the enforcement of those standards is vested in a final authority not under the domination of those concerned with costs and production.

Those who are charged with the maintenance of quality control are not always popular in industry. Regardless of how fine they may be as persons, and how capable they may be in their activities, the efficient discharge of the duties of a quality-control executive is bound to irk others until an organisation is entirely "sold" on the fundamental necessity and ultimate desirability of such a programme. Quality control sometimes shows on the cost sheets, may slow down production at what always seem the wrong times and places, lays blame for carelessness on specific individuals or groups of workers.

To those primarily responsible for costs and others who must get operations completed in minimum time, the urge to combat, ignore, circumvent, deride, subjugate, and even eliminate the real quality-control personnel is frequently a strong one. Until or unless the production group is in sympathy with quality control, the individuals who have the responsibility of quality control should also have the executive authority to enable their orders to be followed despite reluctance in certain quarters.

Quality-Control Programme

The quality-control programme of each food manufacturer depends on the extent of operations, type, and number of products, the make-up of the organisation staff and its laboratory facilities, as well as the experience, attitude, and training of those who direct this important programme. In many instances the system used has evolved by gradual development over a long period of time.

Whatever the set-up employed, proper quality control involves the utilisation of systematic checking of raw materials, finished product, processes, packaging, equipment, and personnel. The methods to attain this end must be sufficiently accurate to accomplish the intended purpose and yet rapid enough to be practical in application. Many of the valuable quality-control methods in food plants have been developed by practical men who have learned by experience how and when certain processes should be started or stopped, and who are accurate in their judgments. Others are methods which have been successfully worked out in plant laboratories to meet special needs. There are to-day countless applications of research procedures and equipment which have been modified to fit the needs of quality control in different food industries.

Research Literature

One of the *rôles* of the food technologist should be to understand the research of to-day, wherever it may have been done, and apply it to the plant process or plant-control processes of to-morrow. To keep posted he must be familiar with the literature, which means that food manufacturers should have at least a small library and subscribe to those journals relevant to their special interest and others which are of a broad scientific character. Without journals and the personal contacts gained at scientific meetings, a man located at a distance from metropolitan or university libraries may literally be blindfolded in so far as his optimum usefulness to his own employer is concerned.

The new bibliofilm services which enable miniature photographs of original articles in journals to be reproduced on movie films, which can be inexpensively shipped anywhere in the world, have already proved a great advantage to those having limited libraries. The entire contents of a number of the finest and most complete technical libraries in the United States are now available through this type of service, which will doubtless increase in usage among industrial concerns during the next few years.

Quality-Control Technique

Quality-control methods are so numerous and diversified that mention of a few to serve as examples must here suffice.

Among the uses of electric equipment to assist in assuring quality are the employment of electromagnets to remove metallic

fragments, nails, etc., from foods; the use of X-rays to detect the accidental presence of pieces of metals or other dangerous fragments in food packages, also to kill insects or their larvæ by lethal exposures; the use of photo-electric cells as activating agents for the automatic sorting and rejection of unsuitable portions or contaminants in raw materials, such as dried beans, on a basis of colour differences, also for controlling smoke densities in smoke-houses. The use of ultra-violet light for creating germicidal atmospheres and the inhibition of bacterial and mould growth on meats and other foods has increased in recent years with the development of new lamps designed for this purpose.

The utilisation of refractometers for rapid control purposes in checking the quality of oils, syrups, jellies, tomato juice, and catsup is common in numerous plants making such materials or using them as components. Viscosimeters also find application in well-standardised control operations on catsup, gelatin, chocolate, and certain edible oil products.

The widening appreciation of the value of equipment for determining hydrogen-ion concentration of final products and of controlling the *p*H during food processes and fermentations has benefited many food operations, among whom the sugar refiners, bakers, and canners are conspicuous.

With the advent of carbon-dioxide gas storage of refrigerated eggs, meats, and fruits, which in the United States is still in its infancy, the development of automatic apparatus now available for the control of carbon dioxide concentrations should be useful.

Cleansing Methods

The dairy industry and numerous others have found chlorine compounds, combined with the use of detergents, most helpful in cleaning containers, equipment, cutting tables, floors, and walls. The fisheries use chlorine in high dilution as a means of treating shell fish for purification and for preliminary treatment in the fillet plants. Semi-automatic sprayers are now available, enabling changes in chlorine content to be made during operations. These may be used advantageously for general sanitation and keeping down contamination on conveyor belts, carts, and tables. Relatively simple, rapid, and accurate methods have been devised for the determination of active chlorine content in sprays for such purposes.

It has been recently reported by Scales,[1] of the Sheffield Farms Research Laboratory, that alkyl aryl sulphonate is an efficient agent in the elimination of bacterial spores in cleaning procedures, either alone or in combination with chlorine compounds, and this agent, which is also non-corrosive, may be more widely used for such purposes in the future.

The semi-automatic quality-control multiple titration apparatus, recently described by Stansby and Fitzgerald,[2] should prove very useful in determining quality in fresh fish and may possibly be adapted to complicated titrations in other food industries.

Tests for Enzymes

The utilisation of tests for specific enzymes has become particularly useful in the frozen foods industries. Unless enzymes are inactivated previous to freezing, changes in flavour occur in a few weeks' storage even at temperatures approaching 0° F. Blanching by heat treatment for a brief interval with temperatures approaching that of boiling water has proved satisfactory for numerous vegetable products, but some means must be used to determine if and when the enzymes are inactivated. Too severe or prolonged heat treatment is also undesirable as it may unfavourably affect flavour, nutritive value, and texture. By using the comparatively simple tests for catalase and oxidase enzyme systems the proper blanching process may be worked out and the same tests used for control of the process. The heat treatment, storage temperature, and care of some frozen products during processing has such a predictable effect on vitamin C that its determination may be used as an index of quality control.

The determination of enzymic activities as means of quality control has been greatly extended by the development of the phosphatase test, which is proving a most useful index of pasteurisation efficiency. The modified phosphatase test devised by Scharer[3] has made it possible to carry out this procedure in less than half an hour with a high degree of accuracy.

The sanitary and quality evaluation of raw milk has been facilitated by the use of resazurin, an oxidation-reduction indicator dye, and milks with high bacterial counts or cell contents may be detected in the relatively short time of an hour by a simple technique.

A modification of this method has been worked out in the Food Technology Laboratories of the Massachusetts Institute of Technology[4] which appears to be applicable to the rapid evaluation of bacterial content of ground meat, frozen eggs, and other food materials having abnormally high numbers of micro-organisms.

The older but more time-consuming plate counts for the determination of bacterial content have continued their usefulness in many food industries as indices of sanitary quality. In the dairy industry a significant change in standard media is bound to improve the standards for milk, as has already been demonstrated in Boston by Mr. Frank Mott of the Boston Health Department. The same medium has application in the quality control of frozen foods which require bacteriological tests of product and equipment at frequent intervals.

Use of Instruments

Some indications are at hand that the use of electrical instruments for measuring oxidation-reduction potentials directly may also have a place in the quality-control methods of the food industries. This is already true in the brewing and food fermentation industries and seems promising in others. An excellent monograph on this subject by Hewitt[5] is worthy of mention.

Immunological methods have also been shown useful as means of detecting constituents of foreign origin in foods, as has been indicated by Glynn[6] in the detection of soy-bean flour as an ingredient of sausage. Similar methods may have applicability in the determination of closely related species of marine products of commercial importance.

The microscope maintains its universal usefulness as an adjunct to many quality-control procedures. In addition to its use in the well-known visual detection of adulterants, bacterial smears for quantitative examinations, the Howard test for moulds and insect fragment tests, the microscope now finds frequent use in studying the histological sections of frozen foods. We may also look forward to wider use of the polarising microscope.

The spectroscopic analysis of foods has numerous applications in quality control, among which may be the use of tracer elements to prove the origin of particular products. From a nutritional standpoint we are likely to improve our knowledge of the importance of extremely small amounts of some of the more rare elements by the use of spectroscopic technique in the future.

Colorimeters have long been used for various chemical determinations and as apparatus for the comparison and standardisation of coloured solutions. Refinements in such instruments have recently increased the usefulness and scope of such equipment to the benefit of many food manufacturers. Photolometers have found utilisation in some laboratories quite recently and are likely to be used more widely in the future.

Spectrophotometers are still a novelty because of the present expense of these instruments, but have proved extremely useful in making accurate determinations of coloured materials and colour changes. The latest instrument devised by Professor A. C. Hardy of the Massachusetts Institute of Technology Department of Physics is one of the finest known and merits inspection. It is said that a moderate-priced spectrophotometer for more general use is to be manufactured by one of the equipment companies within a short time. This may bring such instruments into more common usage.

Anti-Oxidants

A relatively new phase of quality control has assumed increasing attention, as the importance of rancidity and those flavour deteriorations due to chemical changes in fats and oils has been more widely appreciated. The longer storage periods now used for foods at refrigeration temperatures have been a factor in bringing about this interest. A number of anti-oxidants have been proposed which have characteristics favouring their utilisation in foods or materials coming in contact with fatty surfaces. A monograph of particular interest on this subject was published by C. H. Lea[7] of the Low Temperature Station in Cambridge, England.

Many other methods which relate to quality control are utilised in various food industries. There are rapidly widening opportunities for the use of such methods and equipment. In addition to the present known usages there are doubtless many other equally important possible uses or proved applications in quite diverse food industries.

Some methods and equipment that the food industry has found of value have been cited in this brief discussion. Unless one

(*Continued on page 247*)

CORRESPONDENCE

Good Wishes from U.S.A.

The Editor.

DEAR SIR,

On July 1, 1940, I sent you a post-office money order for one pound for continuation of my subscription to FOOD MANUFACTURE. Trust it reached you safely.

We in America are deeply sympathetic for Great Britain in the present critical struggle, and realise if Britain falls America will be the next to have to defend democracy.

Sincerely yours,
W. V. CRUESS,
Division of Fruit Products, University of California.

Canning Opportunities in India

DEAR SIR,

I am indebted to your journal for valuable information regarding the meat trade. There are two problems which I am placing before you for favour of your opinion, guidance and assistance. The prospects of developing these two industries are enormous, especially with the large eastern markets.

At a certain place in Central India over 400 to 800 animals are killed daily for a period of four months. The animals killed consist of buffaloes as well as oxen, and the slaughtering is done in the usual country method—*i.e.*, cutting the heads of the animals in sheds made of grass and the animal is killed on the ground. The carcass is split up into two portions, and thereafter with human labour the meat is cut up into bits of about 1 ft. to 1 ft. 6 ins. long and 4 ins. wide. These bits are then sun-dried, salted, and after they are dried are smeared with mustard oil, and are utilised for "biltong" trade. About 300 lb. green weight of meat is dried to about 80 lb. in ten to twelve days.

The various endocrine glands, liver, spleen, testicles, tongues, tails, etc., are put on the manure heap, and are never utilised. Some of these products might be canned or otherwise elaborated. Unfortunately, the Hindu sentiment is against this industry, and many people would not join, but there are persons who are willing to put a quarter share into the business and give assistance, if some British friends would come in and start the work.

Incidentally, a small start by way of preparing meat extracts for the Indian market, of the type of Oxo or Bovril, would be very profitable. The cost of fresh meat is about 1 rupee per 80 lb., and cattle are cheap, and no meat or liver extract industry exists in India.

Further, the dry salted meat in chunks referred to above could be pressed into bales or powdered and exported, if there were a market. Could you inform me of the possibilities, prices and some addresses? I understand some stuff like that comes along pressed in boric powder from the Argentine. Further, is there any possibility of marketing meat extracts in a solid or semi-solid form?

The other industry is milk and milk products. I am located at a place where a herd of 1,000 and over buffaloes in milk could be kept, with grazing facilities extending over 50,000 acres, with excellent pastures. The average daily production of milk is in the neighbourhood of 8,000 lb. There is no outlet for fluid milk, and it would have to be converted into manufactured products. The winter temperature ranges from 65 to 85° F., and summer for two months ranges from 95 to 105° F. During this latter period only products such as butter and casein could be worked profitably.

The forms in which the milk might be converted are as follows: (*a*) Milk to be skimmed and the cream tinned. A plant for tinning 500 to 600 lb. of cream daily capacity would be required. (*b*) There would be left 6,500 to 7,500 lb. of skim milk. This could be made into skim milk powder, milk sugar and casein.

I am aware that the quantities are small, but to start slowly and with the lowest economic unit and gradually increase would be best.

I should feel extremely thankful if you should put me in touch with potential investors who could go 50:50, and I shall be glad to give any further notes required regarding both the schemes. I have important concessions in connection with the land, water and taxes.

The meat trade would be ideal for the eastern markets—*e.g.*, Burma and Siam, apart from extracts being well consumed in India, while milk and milk products, particularly casein and butter, have a big internal market.

I claim this help from your good selves as a special favour in the interest of the two countries, and would mention that I am an ex-Senior Marketing Officer of the Government of India and have wide and vast experience in the cattle trade.

Yours truly,
C. B. SAMUEL, M.A., B.Sc., F.D.A.S.

SEHORE, C.I.
June 20, 1940.

FANCY CANNED RABBIT

ERIC HARDY, F.Z.S.

CANNED rabbits have neither interested the British canning industry nor the purchasing public to any large extent; but the arrival of another trapping season when western Scotland keepers may again bury their rabbits for the want of profitable transport arrangements to the market makes one wonder if this waste of good food can be avoided. From the marketing point of view the trouble with the rabbit is the same as with the herring—it is too cheap to be appreciated by the public which normally gauges food value by price. War-time has altered things, and in the exploitation of natural food sources the canning industry could improve upon the efforts of the last war by mixing boneless rabbit with vegetables and gravy, or game and wild duck, ready cooked for heating and serving up as a composite dish under an attractive and palatable name and trade label that does not speak too plainly of cheap rabbit flesh.

If we review the position in the last war we see what the increasing price of rabbits did to put them on the market. When they were priced at two shillings per couple it paid to trap them and market them: the surplus created by the calling up of gamekeepers and trappers was checked towards the end of the war by the fact that prices had made it profitable to make the rabbit a first-line food commodity. In some places rabbits sold at five shillings a couple in the last war, and skilled trappers were able to kill a thousand in a fortnight. Scotland, west Wales and Pembrokeshire, and Cornwall are the areas most likely to maintain a regular supply of rabbits by the thousand, and transport is generally by passenger train.

Some Composite Dishes

There are various composite dishes in which rabbit can be tinned for soups or meat dishes. The most seductive of soups, the famous "potage a la Bagration" of the old Palais Royal often had rabbit flesh for a foundation. Onions were the first vegetables traditionally cooked and served with rabbits in the days when the rabbit held an honoured place at the banquet. By some chemical action the mild onion brings out the best flavour in the rabbit. The onions can be chopped up with melted butter rolled in brown flour and brown gravy; pepper and salt are added. A little walnut pickle and port also add to the flavour. Mushrooms and celery make a pleasing vegetable mixture for rabbit flesh.

Rabbit flesh is excellent for mulligatawny soup. It is boiled in water with black pepper and a slice or two of bacon, simmered, strained and then fried with bacon; it is added to the stock and simmered. After three-quarters of an hour some lightly browned flour, with salt and cayenne, is added, the simmering with boiled rice is continued until the meat is tender.

Rabbit flesh is much more appetising if it is fried before simmering. A dash of lemon often adds to the taste. Rabbit makes an excellent soup if small pieces are fried with bacon, onions, and carrots and then stewed in beef stock with celery and minced parsley. Rabbit curry is an economical way of using up remains from previous food dishes made into good stock.

Cream of rabbit soup is made with onion, celery, milk, some savoury herbs, egg-yolk, flour, white stock, and bread, while brown rabbit soup is made with onions, carrots, and cold water. Rabbit *à la Poulette* and rabbit *à la Provençale* are dishes which have come from the French and lend themselves well to canning.

It is probable that all that the public dislikes about rabbit is its name.

WAR-TIME LABELS

A brief discussion on the implications of the Control of Paper (No. 16) Order

W. H. SESSIONS, J.P.

THERE has been a certain amount of doubt about what is included in the Control of Paper (Number 16) Order of May 25, 1940.

The two main paragraphs of the order so far as labels are concerned are:

3.—(1) No person shall, in wrapping or packing any article for wholesale distribution (*a*) use any greater quantity of paper wrapping or packing material than such as is reasonably required for the protection of the article.

(2) No person shall in connection with or for the purposes of any sale by retail (*d*) affix to the wrapping or packing or carton or container any advertising matter the area of which exceeds 20 square inches.

I think the first question is whether a label can truly be said to be advertising matter. Labels can be partly label and partly advertising matter. They may indeed be part of the wrapping.

I should divide the average label in commerce to-day into three uses:

(A) A label—stating the goods inside—*e.g.*, Plum and Apple Jam.

(B) Advertising matter connected with this—*e.g.*, Blank's *Luscious* Plum and Apple Jam.

(C) Wrapping designed either for appearance or for the protection of the article.

As regards (A) it is perfectly clear that the goods must be labelled, and in practically every case this part of the work of the label of commerce can easily be kept well under 20 square inches. I feel sure that the only restrictions in this use would be if the label were made unnecessarily large.

Turning to (B), the name of the brand, pictures or designs, having for their object the helping of sales, and all other sales-promoting matter, must certainly come within 20 square inches. If I were asked for a ruling I should say also that the moment you cease from merely saying on a label that it is "Plum and Apple Jam" and say it is "Blank's Plum and Apple Jam" or "The Blank Brand Plum and Apple Jam" you have crossed the line from labelling, as such, into advertising; but that is only my own opinion as to where the dividing line comes.

When (C) is considered we can easily see that there are certain articles which may need paper for protection, which would be very much larger than 20 square inches. The 20 square inch restriction can obviously be got over by gumming on a loose label in which the advertising matter is kept within the limit of 20 square inches. It may be, however, more convenient and actually save paper to have the label and advertising matter printed direct on to the sheet of wrapping used for protection. In many cases this would save labour as well as paper. If the larger sheet of paper were necessary for the protection of the article, I cannot see those objecting who have to administer Order Number 16, because printing direct on to the paper instead of using a label would actually mean the use of less paper, which is the whole purpose of the order.

The material part of the order is therefore the first portion I have quoted. The firm packing the goods would have to consider the problem of reducing the material used to the minimum necessary for safety and, if requested, to prove this to the Controller. If this protective material is larger than 20 square inches they would undoubtedly have to see also, under the other paragraph quoted, that the advertising matter did not exceed 20 square inches.

Another point in connection with these restrictions is that where smaller labels have to be used it is very necessary for them to be good. Size in itself often helps to make good display, and when this is restricted the same amount of display and therefore selling value can be secured only by greater care in the designing of the smaller label and also of the reduced advertising matter. This can be done, because in my opinion the most beautiful and attractive labels I make are those of only 1 or 2 square inches. It can well be understood that where there is only about 1 square inch of paper upon which to work in designing a label it is very necessary for the artist to put all he knows into making that 1 inch perfect. Perhaps this is why some of these miniature labels give me personally, as a man enjoying my craft, very real pleasure. They have to be, and I venture to think are best described as, "gems"! I mention this just to show that nobody need be dismayed by having to reduce the size of a label. Careful designing can overcome any sales attraction value lost by the reduction in size.

Again enough is not always made of the value of what printers term "white space". If the label or advertising matter has to be reset and there has to be a good deal of unprinted paper round it, it will make all the difference if the advertising matter is placed correctly with its wide boundaries of blank paper. If it is placed in its proper balance the whole effect is pleasing. If it is placed anywhere, for instance in the middle, it looks what it is, some advertising matter restricted in size; whereas the blank paper can be made by balance to be part of the whole scheme of design. I am sure the Controller would welcome such attractive use of "white space". He does not like to have to control us, and we know, and he knows, that it is only the nation's necessity which makes him have to do it. I think it is therefore a public duty resting on everyone cheerfully to accept the limitations made necessary by the nation's needs, and to try to find out the best way of carrying out this and other orders. That is why I am suggesting some ways and means of working the order successfully, which is much better than trying to look for ways and means of avoiding it!

SEAWEED ON THE MENU

SEAWEED is the latest addition to the many suggestions which are being made to enlarge and vary our war-time menus. The idea of making a meal of seaweed may surprise many people, for the present generation has not the same familiarity as its predecessors with the habit of eating dulse—a species of small, smooth-leaved seaweed, of which Scottish people and others used to be very fond.

Purple laver, to give dulse its proper name, is generally eaten uncooked by Scottish people; but in some parts of England it is eaten as an accompaniment to roast mutton, and also served as a savoury on toast. There are other ways in which dulse is made into a very palatable dish for the table. On the Welsh coast, for example, it is made into what the people of those parts call "seaweed cakes," or "seaweed bread."

Dulse is not the only species of seaweed capable of being used as human food. Green laver, which has broad, plaited glossy green leaves, is also made into a kind of cake. Then there is the Carageen species, which, like dulse, grows abundantly in the shallow water of the beach on our coasts, and which, after being washed in fresh water, and bleached and dried in the sun, is boiled in milk to make a creamy jelly that is not only subtly flavoured, but very nutritious.

A good many years ago it was seriously proposed by an American expert that the utilisation of seaweed for food should be organised scientifically and commercially. His argument was that the world's population was increasing too rapidly to enable sufficient wheat to be grown to feed the teeming millions, and that proper use should be made of the unlimited resources in seaweed, with which the seashores of all lands abound.

This authority, indeed, went so far as to estimate that in the Sargasso Sea alone "sufficient nutritious vegetation flourished and decayed to support the entire population of Europe if it were harvested and prepared in a manner fit for human consumption."

While this scheme, and especially the arguments advanced for its necessity, may be far-fetched, there can be little doubt that we have so far neglected the interesting possibilities of seaweed as a foodstuff. That, however, is not the case in some other lands. The Japanese, for instance, esteem seaweed greatly, especially a brown-leaved variety, without which no banquet menu in Japan is considered complete.

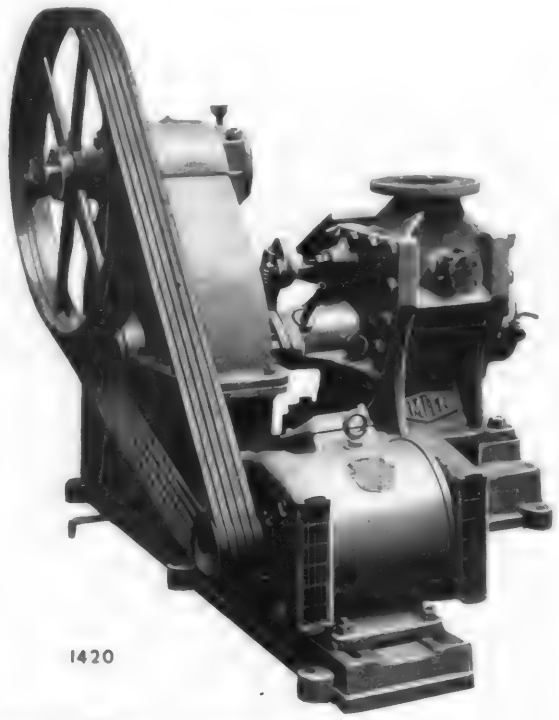
PLANT AND EQUIPMENT
FOR
THE FOOD INDUSTRY

British manufacture and economical operations are essential specifications in war-time food plant and accessories. The following notes summarise some new developments

Limitation of Home Supplies

The attention of manufacturers of machinery and plant of the classes set out in the Schedule to the Machinery and Plant (Control) (No. 2) Order, 1940, and of persons who desire to acquire such machinery and plant is directed to Article 4 of the Order, which provides that the machinery and plant described in the Schedule shall be deemed to include any steam generator (including feed-water supply), prime mover, electric generator (including control equipment), and electric motor exceeding 15 h.p. (including control equipment) designed or appropriated for use in conjunction with any such machinery or plant.

Applications in respect of such machinery and plant should be addressed to the Industrial Supplies Department (Machinery Licences Division), H.O., Board of Trade, 25, Southampton Buildings, Chancery Lane, London, W.C. 2.



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Pump for Heavy Liquors

A pump which fully meets the exacting conditions necessitated by the efficient handling of molasses, massecuite and other viscous and heavy liquors, especially those containing sugar crystals, is the "Rota" pump, which the manufacturers, A. and W. Smith and Co., Ltd., state has given excellent results in sugar factories during recent years.

In the handling of massecuite this pump, having no internal intermeshing parts, eliminates the difficulty frequently experienced through the grinding of the crystals and internal abrasion of the machine.

The pump body provides roomy passages for the liquor, and all working parts are easily accessible. Water connections to the rotor spindle bearings are provided for the intermittent washing away of any hardened massecuite, and are fitted with inlet cocks and short outlet tubes. A perforated gun-metal sleeve ring is provided inside the stuffing box to allow of easy access of washing water.

Filling Machine for Peas and Beans

The automatic filling machine of the five-pocket, rotary, telescope type fills the cans with a predetermined quantity of peas or beans, and is readily adjusted by a hand screw. From the rotary hopper peas drop into revolving pockets as they pass under the hopper, and through funnels into the cans, prior to brining, so that a measured amount of peas will be found in each can irrespective of the amount of brine introduced. The manufacturers, Robert Kellie and Son, Ltd., point out that this is important, particularly when filling a product carrying a sauce or coloured syrup, as the separate measuring and filling of solids and liquids will immediately indicate whether the cans are properly filled.

The machine is fitted with a no-can-no-fill attachment, which is simple and works perfectly. It will not allow peas or beans to drop should the can not be in the runway, and does not stop the filler. Operated by a clutch lever, the machine will fill small tins of peas as well as large sizes, and a special lever is provided whereby cans in the machine can be run out when changing grades of peas.

Boiler Tubes

In a straight boiler tube much of the gas naturally passes down the middle of the tube without contacting the tube walls at all. By putting a "wave" in the tube all gas molecules are continually forced against the tube walls, which increases the rate of heat transference some 2 to 2½ times. Thus a high tube efficiency is obtained and makes it possible to use induced draught with only one pass of tubes of normal length.

Cochran and Co., Annan, Ltd., state that a high working efficiency can be obtained; larger outputs are also possible than hitherto, their 12 ft. 6 ins. dia. unit being rated at 25,000 lb. steam/hour.

With a doubled rate of heat transference, fewer tubes are required to obtain necessary output. Wider ligaments and larger breathing spaces thus become possible. Waisted flues are incorporated in order to provide easy access to the interior of the boiler. In the boiler the wide water spaces between tubes, flues, and boiler sides afford complete accessibility to all the water surfaces, which make cleanliness easy.

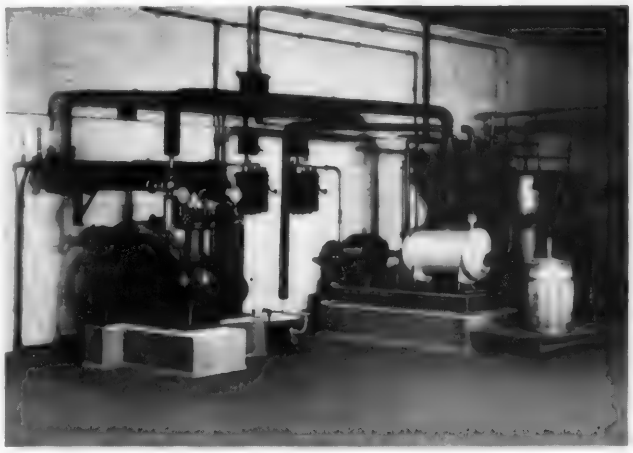
In order to handle the increased volume of gases passing through the boiler, a 7-ft. combustion chamber is added, with brick arches extending over each flue. This space, beside acting as an efficient grit collector, ensures complete combustion of the gases, thus eliminating smoke. The arches deflect the products of combustion so that they travel the maximum possible distance before entering the tubes, which avoids the ignition of the gases at the back tube plate.

Vacuum Capping Machine

A machine intended to seal under vacuum various types of caps on glass containers, such as are used for fish and meat pastes, prawns, and other foodstuffs, is made by Ashworth and Parker, Ltd.

The jars, after being filled and the caps loosely fixed on by hand or from a magazine are fed to the conveyor, from which they are transferred automatically to the table, which in turn brings them under the sealing cylinder. This descends and makes an airtight joint on the table round the jar. A ram then comes down and holds the caps lightly on the jar, a vacuum is created in the cylinder, and then the sealing head closes in the skirt of the cap under the rim on the jar after it has been under vacuum the designed period.

The vacuum is then broken, the sealing cylinder rises, and a movement of the table transfers the sealed jar to the right-hand delivery conveyor.



Atomising and Cooling Machine

A recent introduction to the edible fat industry is a machine for improving the plasticity of fats by dispersing and atomising contained air, emulsifying margarine mixtures and combining these processes with cooling from the liquid state. The plant when started requires no attention beyond maintaining the supply of warm liquid compound in the feeding vessel.

The illustration shows the machine arranged for cooling, combined with an ammonia compressor feeding vessel and pump. This plant, made by William Douglas and Sons, Ltd., is particularly suitable for hog lard, Premier Jus, dripping, compound, or tropical margarine.

For obtaining a pure white fat from edible waste material the makers claim that the Douglas Digesters are extremely efficient. The cone refining pan separates the water and fine sediment from the hot liquid fat and also rectifies fatty acids when processing for edible fats. It is also stated that using rough edible material, inclusive of bones, a fine white fat free from fatty acids can always be relied on.

Tinning Process

For many years tin has been recognised as an efficient corrosion-resisting metal, invaluable in all forms of processing where hygiene and purity are essential. The hot-tinning method of applying coatings is the one generally used, and J. H. Randall and Son, Ltd., have introduced their "Alloy-Coat" Hot Process which can deal satisfactorily with a variety of articles ranging from a few ounces to a few tons in weight. They have also evolved a process which electrically deposits tin to almost any pre-determined thickness and the combination of the two methods has been named the "Randalloy" process. Articles of mild steel, copper or brass can be coated all over by immersion and almost any size vessel can be tinned internally.

Any form of large capacity pans and containers used in the food industry, such as dairy plant, etc., are particularly suitable for this form of tinning, as such vessels are then corrosion-resisting and can carry out their work under conditions of hygiene and purity.

Brush Painting by Power

Practical painters generally contend that a good quality paint, well brushed in, will provide greater protection to the surface coated for the prevention of corrosion and decay than any other form of paint application.

The centuries-old principle of brush painting has been used as the basis of the Bromak method, whose essential feature is claimed to be simplicity of operation. Instead of dipping a brush into a kettle of paint, the paint is charged under pressure into the interior of the bristles of the brush. The control and supply of material is governed by the simple operation of pressing a button, fitted in a convenient position in the body of the handpiece.

Depressing this button opens the paint outlet into the brush, and the quantity of paint flowing into the bristles is governed by the length of time this button is depressed. Releasing the button instantly closes the paint outlet, so that the operator has complete control over the quantity of material passing into the brush.

This process designed by the Bromak Pneumatic Paint Brush, Ltd., is specially suitable for use in the interiors of food factories owing to the absence of splashing, paint mist and mess.

Cold Storage of Fish

Specially designed to meet the requirements of the fish trade, the 10-12 stone fish cabinet provides correct temperature and humidity for fish storage in all parts of the cabinet. It will hold 10 to 12 stone of filleted fish, which it preserves in good condition, and prevents discoloration, drying, or marking. The temperature of the cabinet is maintained automatically and can be varied over a wide range by means of a single knob control.

Three galvanised fish drawers are supplied which enable the user to separate different kinds of fish. These drawers are provided with inclined, loose, non-perforated bottom trays which ensure that the fish is properly drained and not marked in any way.

Although no ice is required for short period storage there is provision for $7\frac{1}{2}$ lb. (sixty cubes) of ice per freezing in the three ice trays in the cooling coil at the top of the cabinet.

This Prestcold 10-12 Stone Fish Cabinet is manufactured by the Pressed Steel Co., Ltd.

Pig Food from Kitchen Waste

A number of experiments have been carried out during recent months for the production of a meal or food from kitchen waste which would be suitable for feeding to pigs and poultry.

It was obvious that the kitchen waste food could be used satisfactorily for this purpose, as during the winter a number of boroughs had collected such waste and fed it to the pigs almost immediately after collection. The problem, then, was to produce a dry meal or food which would store for long periods without going bad and could be distributed as required.

The Kestner Evaporator and Engineering Co., Ltd., claim that after certain investigations and experiments they have evolved a modification of their double drum film drier which produces a satisfactory product. The feeding of a mixed product such as kitchen waste naturally presents considerable problems, but a special disintegrator has been made to overcome these difficulties.

The dried product produced is in the form of a crisp flake, which when mixed with water rapidly softens and combines to form a satisfactory feed. One feature to which the makers call attention is the short time contact which ensures that the nutritional value of the food is not destroyed.

Filling and Stacking Machine

As compared with the single unit type, the twin head envelope and bag feeding, filling, folding and stacking machine gives a greatly increased output for larger users. With this machine it is possible to obtain outputs of 100 to 120 per minute.

Substances most frequently dealt with are custard powder, soup powder, seeds, etc., but the machine can be used for any material which it is desired to pack into small envelopes or bags.

The bags are automatically fed two at a time from magazines to the filling point, and after being discharged they are taken to the gumming and folding units. They are then sealed and discharged down a stacking chute ready for cartoning. Attachments for counting the number of bags can be obtained if required. This machine is manufactured by the Automatic Weighing and Packing Machine Co.

Sparking Plug Cleaner

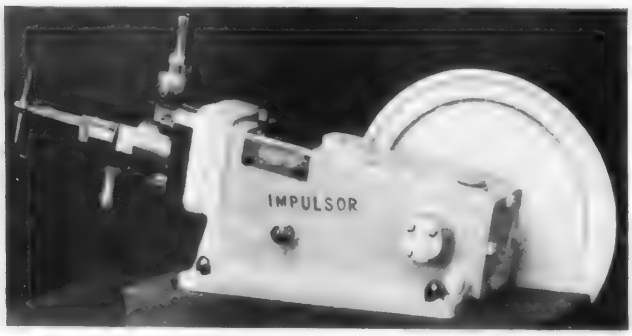
Claimed to be the first device to offer a completely successful method of cleansing sparking plugs quickly and efficiently, this new model has been developed to meet the need for dealing expeditiously with plugs of all types both for car and aero engines. Its value under present conditions can scarcely be exaggerated, and has led to its speedy recognition by many Government Departments.

This B.E.N. Sparking plug cleaner has been re-designed by B.E.N. Patents, Ltd.

Emulsifier

Homogenisers capable of handling quantities up to 1,000 gallons an hour have been widely adopted by concerns dealing with the preparation of large quantities of food and dairy products, but these machines are hardly suitable for small users, or at least it would be uneconomical to install such a machine unless it was intended to operate it practically at maximum output.

The Impulsor Emulsifier, however, has a capacity of from 8 to 12 gallons an hour. It comprises a single cylinder and a single acting pump, designed to operate at high pressures. This pump forces a pre-mixture of the product through an extremely fine orifice in the discharge valve at a very high velocity, resulting in a reduction of the particle size, and an efficient dispersion of these finely divided particles in the rest of the product.



Discharge of the product takes place through the combined spring-controlled discharge and homogenising valve comprising a nozzle-shaped seating, the small orifice of which is closed by a flat end reversible spindle by the action of a powerful spring. The spring tension is adjustable by a handwheel, which enables the operating conditions to be varied within wide limits.

The emulsifier is made by the Improved Emulsification Process Co., Ltd.

Mixing Machinery

The latest improved pulley drive vertical mixer is claimed to be very strongly constructed, the upright standard and baseplate being of solid iron, machined where fitted together. Alterations have been made in the gearing, so that the driving pulleys run at double the speed they did formerly to give the same speed on the bow and stirrers. This results in eliminating belt slip and general strain in the drive.

The bow and stirrers are of gun-metal and revolve in opposite directions. The cross-stirrers are at a certain angle which experience has shown to be the best for mixing, and the bow is fitted with hinged scrapers, which thoroughly scrape the pan sides at each revolution, and, being hinged, they adjust themselves to the exact shape of the pan.

The pans are made from solid copper circles, the inner and outer cases which form the steam space being made from one solid piece of copper, without any brazed seams.

The makers, Wm. Brierley, Collier and Hartley, Ltd., supply this machine in varying sizes with bow and stirrers in either lignum vitæ, gun-metal, or aluminium.

Marine Storage Thermometer

The accurate measurement of temperature has become increasingly important in connection with food storage in ships during transit from the country of origin to that of consumption. Much scientific research on the effect of temperature on cargoes to prevent deterioration during transit has taken place during the past few years. As a result of suggestions from the Low Temperature Research Station after studying the problem, the Marine Storage Thermometer has been evolved by the Cambridge Instrument Co., Ltd.

The fundamental difference between this new type of instrument and the patterns generally employed is that it utilises a "null" or balancing method of reading, resulting in a more open scale, a higher degree of accuracy and greater freedom from the effect of vibration. The "null point" method of reading is extremely accurate, and is more easily carried out in circumstances when vibration may cause "dancing" of the indicator pointer.

The indicator, together with the slide wire and a selector switch enabling 6, 12, 18, 24, 36 or 40 thermometers to be connected, is totally enclosed within a metal case, which may be arranged either for wall mounting or for flush mounting on a panel.

War-time Industrial Lighting

War-time conditions have shown that peace-time industrial lighting methods are not entirely satisfactory and that considerable emphasis must be placed on the quality of the lighting if the welfare of the worker, and therefore his productive capacity, is not to suffer as a result of long hours spent under artificial lighting.

Much work has been done on this aspect of industrial lighting in recent months, and the Fifth Report of the Departmental Committee on Lighting in Factories provides a very good basis for the design of satisfactory installations. All the terms of the Report can be met if the installation is designed around the use of low surface brightness units, which may mean the masking of filament lamps by diffusing screens, or the adoption of lamps which themselves have a low brightness.

The British Thomson-Houston Co., Ltd., have recently introduced a Mazda mains operating 60-inch 80-watt tubular fluorescent lamp and a general purpose industrial reflector, which will assist in eliminating glitter from the work and dazzle from the local field of view.

The blacking out of north sky rooflights is inclined to have a depressing effect in some factories, and deprives the workers

of the stimulating effect of abundant daylight. In an endeavour to reproduce artificially the effect of a north sky rooflight, a new type of lighting unit has been introduced. Each rooflight consists of a glazed framework housing up to eight 80-watt fluorescent lamps, together with control gear, and the units may be used either as the only source of artificial light or to supplement localised lighting.

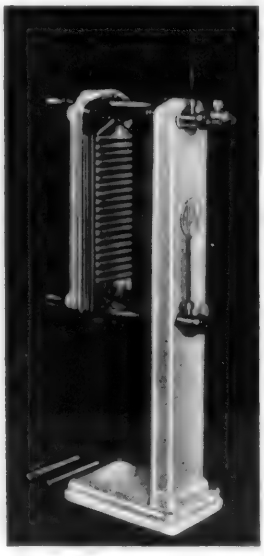
Lighting Intensity

In the new report the Committee has raised the recommended minimum of lighting intensity from 1 ft. candle at floor level to 6 ft. candles at 3 ft. above the floor. There are some situations in which a lower intensity is permissible, but for most working areas this figure is the smallest allowed.

This alteration, of course, cannot be carried out merely by indiscriminate fitting of higher powered lamps. A planned scheme must be devised, in which existing lighting points and mounting heights are used to the fullest advantage with a minimum dislocation of production and careful use of available materials. Besides the arrangement of fittings, there is the choice of a suitable light source to be considered. High pressure mercury vapour electric discharge lamps are highly commendable for most industrial purposes on account of their increased visual acuity, although fluorescent electric discharge lamps have the advantage of cancelling the tendency to create an unpleasant appearance of the human face.

Local lighting, important for fine detail work, must, of course, always be supplementary to general lighting, and brightness at the working level must not be more than ten times that of the surroundings, otherwise there will be a tendency to eye strain. In this connection the General Electric Co., Ltd., are marketing a lamp known as the Osira 5 ft. mains voltage fluorescent tubular lamp.

Heat Exchanger



The Junior (H.T.) model heat exchanger, although primarily employed on dairy production, can also be used for pasteurising fruit juices, cooling salad cream and other liquids. This model, made by the Aluminium Plant and Vessel Co., Ltd., has all the features which characterise the larger models, but the capacity ranges from only 50 g.p.h. to 150 g.p.h. When open for cleaning, it can be seen that the plates, like the rest of the metal which comes into contact with the liquid, are of stainless steel.

Colorimetric Analysis

At this time, when labour is scarce and conditions unfavourable to careful leisurely investigation, any apparatus which assists the works chemist in performing his routine tests in a minimum of time is welcome. Routine colorimetric chemical tests depend on determining either the extent of a colour change or the increase (or decrease) in the intensity of colour when a reagent is added to the sample being tested. The Lovibond Comparator, and B. D. H. Lovibond Nessleriser, made by the Tintometer, Ltd., provide a series of discs containing permanent glass colour standards to match and record such changes.

One hundred and twenty different discs are now available, each representing a chemical control test, which can be carried out by using the appropriate disc. Of likely interest to the food manufacturer are lead, iron, copper (in view of the copper content restrictions of tomato pulp), cobalt, and nitrites and nitrates in connection with curing and pickling.

There are also two discs for sulphur dioxide and carbon monoxide which have been approved by the Home Office for the estimation of toxic gases in the atmosphere of industrial premises.

Centrifugal Pump

The ordinary arrangement of a centrifugal pump combined with a motor consists of separate units mounted on a baseplate common to the two and having their shafts suitably coupled. Such an arrangement, of course, necessitates the aligning of four bearings, but to overcome this difficulty flexible couplings are introduced between the pump and motor. Even these are not entirely satisfactory, especially in the smaller units, and Rhodes, Brydon and Youatt, Ltd., have designed their Mopump in which both baseplate and couplings are eliminated.

In the Mopump the motor and pump form one unit, the alignment of the various parts being assured by accurately turned spigots. One motor end cover is arranged with a distance piece which carries the pump and its parts.

The pump impeller is provided with a stem or sleeve which passes through the stuffing-box and into which the motor shaft is fitted. This sleeve completely protects the shaft from contact with the liquid in the pump.

Either D.C. or A.C. motors can be built into these units, which can also be arranged to operate either vertically or horizontally.

Acid-Proof Stoneware

The demand for acid-proof stoneware not only for use in the manufacture of foodstuffs but also in their storage and packaging is greater to-day than at any time since the last war. Since 1914, however, the position has changed essentially. It is no longer only a question of finding a " substitute material " to replace metals which are required for essential war purposes. This is so, naturally, to a certain extent, but long before last September acid-proof stoneware had begun to occupy an increasingly important place among the materials used in the food industries.

Stoneware offers certain advantages for use in the food industries, most important of all being its unequalled resistance to chemical corrosion and contamination. Acid-proof stoneware neither affects nor is affected by the liquid or solid foods in the manufacture or packaging of which it may be employed. The flavour and taste of foods and essences are unimpaired however long they remain in contact with stoneware.

Two drawbacks to the use of stoneware for certain purposes have been limitations in the size of vessels and plant and lack of resistance to high temperatures. Doulton and Co., Ltd., state that vessels and tanks are now available up to a capacity of several hundred gallons, and where still larger sizes are required the difficulty is overcome by the use of specially designed stoneware tile linings. Research by British ceramists has also made it possible to supply a new type of stoneware with such a greatly increased resistance to high temperatures that it is now possible to satisfy all normal demands of the plant user in this direction.

Centrifuging Fruit Juices

The present glut of home-grown plums, said to be 20,000 tons in excess of all possible forms of consumption, recalls a similar instance during the first World War. In 1917 there was an abnormally large cider fruit crop, which resulted in the conversion of a portion of this crop into concentrated apple juice. How much easier would this work have been if modern chemical engineering machines and materials had been available.

Since 1917 the development of the centrifugal has greatly simplified all such processes. The principle upon which the machine is designed makes it specially suitable for processing edible materials and it is now in wide use in the food industry.

It is used in the production of concentrated juice to remove suspended colloidal matter, sediment and wild yeasts from the freshly pressed fruit and also to control the pectin content. If too much pectin is present in the juice it will solidify when concentrated, but it has been shown that if pectin compounds are removed by the use of an enzyme the juice can be concentrated without gel formation. It is most important to produce clear products, and hence the juice must be clarified before concentration.

Sharples Centrifuges, Ltd., claim that the only satisfactory method of doing this is to clarify the juice centrifugally, as the type of solids present tend to lower the efficiency of other methods.

NEWS FROM THE INDUSTRY

Dried Vegetables

The Ministry of Food announces that until further notice no licences will be granted for the importation of dried vegetables or vegetable powders. Production in this country should be sufficient to meet requirements.

* * *

Food Week for Glasgow

The Glasgow Education Authority have been asked by the Ministry of Food to co-operate in a Food Week Campaign to be held in the city from September 30 till October 5.

The object is to stress at the beginning of the winter session the importance of right feeding, and various devices in propaganda are contemplated, including demonstrations to children in schools.

A sub-committee is to examine suggestions of how the campaign might be helped.

* * *

Import Licensing

The Board of Trade announce that from August 5 the Open General Licence (Notice to Importers, No. 89) authorising the import of the following goods from the countries specified has been revoked, and separate licences to import will now be required:

From Eire:

Fruit preserved (with or without sweetening matter) in airtight containers, excluding fruit pulps, jam, and marmalade.

Vegetables preserved in airtight containers (this includes vegetable pickles preserved in vinegar in airtight containers).

* * *

Factory Black-out

With the approach of longer hours of darkness, the question of factory black-out becomes increasingly urgent. Factory managers who are again faced with the question of obscuration of lighting are therefore reminded that a pamphlet called "War-Time Lighting Restrictions for Industrial and Commercial Premises" can be obtained from the Stationery Office or through any bookseller, which gives complete information on the subject. The price of the pamphlet is 2d., or 3d. post free.

This pamphlet, issued shortly before the war, is still completely up to date.

* * *

Rothamsted Experimental Station, Harpenden: Plant Pathology Department

Mr. F. C. Bawden has been appointed Head of the Department of Plant Pathology in succession to Dr. J. Henderson Smith, who is shortly retiring, having held the post since 1932. Mr. Bawden was a Scholar of Emmanuel College, Cambridge, and after taking a First Class in the Natural Science Tripos and the Diploma in Plant Pathology, he spent five years as research assistant at the Potato Virus Research Station, Cambridge, under Dr. R. N. Salaman. In 1936 he transferred to Rothamsted to take charge of the investigations on virus diseases of plants, in which he has been conspicuously successful. He was invited last summer to lecture on his investigations in the United States, but returned to this country shortly after the outbreak of the war.

* * *

Centrifugal Milk Pumps

The centrifugal milk pump has been developed to meet the growing demand for an efficient and hygienic means of handling milk in bulk. The passageways are so designed that pockets are avoided, the milk being compelled to flow evenly and smoothly from suction inlet to delivery outlet, rendering it impossible for any stagnation to take place during pumping. The inside of the pump and impeller are finished with a polished surface, and the outside is white enamelled.

To facilitate cleaning, provision has been made for the removal of the cover and impeller in a few seconds without the aid of any tools. The cover is secured by three wing nuts, which can be loosened by one turn, while the impeller is removed by giving it a quarter turn on the shaft and a slight pull.

The manufacturers, Worthington-Simpson, Ltd., claim that careful design and experimental work, together with the selection of suitable materials, has resulted in the production of a pump which is thoroughly reliable and suitable in every way for this particular service.

* * *

Emulsifying Processes, Ltd.

We are informed that this company ceased to operate on the outbreak of war, conditions making it impossible to carry on.

The company has not been formally wound up as it is hoped that business will be resumed. This largely depends upon two patents pending, which may have far-reaching results, and the terms of an agreement which it is hoped to effect with Moritz Chemical Engineering Co., Ltd., when it becomes possible to contact their directors, at present somewhere in France.

It has been stressed that Moritz Chemical Engineering Co., Ltd., are in no way associated with, or responsible for, the affairs of Emulsifying Processes, Ltd.

* * *

"Accidents in War-Time"

A significant article by Mr. Eric Farmer, of the Industrial Health Research Board, on Accident Proneness and Accident Liability appears in the current issue of *Occupational Psychology*. After indicating the main factors determining accident incidence and the results of investigating accident proneness, Mr. Farmer deals with the prevention of accidents during war-time.

"The necessity of increased production and the dilution of labour brought about by war conditions will greatly increase accident rate, unless special precautions are taken." "If the length of the working spell is unduly increased, hourly output is reduced and the accident, sickness and absentee rate increased."

In this connection, Mr. Farmer emphasises the great importance of training ordinary workers for unfamiliar tasks, and the even greater necessity of adequate training for young and inexperienced workers.

Mr. Farmer stresses the importance of accidents in relation to nervous tension and unrest, and urges that industrial accident rates should be most carefully watched for evidence of strain.

* * *

Laugh and Learn

When thousands of new workers are coming into industry the problem of accidents is one confronting the manufacturer. A little booklet, specially prepared for the neophyte, has recently been published by the National Safety First Association (Inc.), and is entitled "We don't want to lose you". The text gives details of the main things which may happen in a factory, and how they may be avoided, while the illustrations, by Mendoza, underline them in a humorous way. The booklet is an excellent example of the visual-humorous method of imparting warnings made familiar by Fougasse's posters about "idle talk", and it may be had for the modest sum of 3d. post paid.

* * *

Lectures on Food Contamination

A short course of lectures on food contamination by poison gas has just been completed at the Smithfield Institute. The demand for such lectures was evidenced by the fact that owing to the numbers the class had to be held in triplicate.

The lecturer was Dr. Wooldridge, M.Sc., Ph.D., M.R.C.V.S., and the practical nature of the course has been greatly appreciated.

* * *

Laboratory Chemicals

Catalogues containing current prices are rare things nowadays. A new catalogue of laboratory chemicals has just been issued by Griffin and Tatlock, which should prove of value at the present time, as there have been many changes in chemical prices since the outbreak of war. It goes without saying, however, that the new prices are liable to further fluctuation, but the information is nevertheless very useful.

* * *

War-time "Flower" Show

The Minister of Agriculture and Fisheries, the Rt. Hon. R. S. Hudson, M.P., attended the opening day of Southport's National War-time Vegetable, Fruit and Flower Show, which was held from August 28 to 30, with the

main object of encouraging the production of more food and demonstrating methods of preserving vegetables and fruit by bottling and other means. These demonstrations and lectures were arranged by the Ministry of Food in collaboration with the National Federation of Women's Institutes, the F. L. Calder College of Domestic Science, and the British Growers' Council.

This year the show was adapted to war-time conditions, where vegetables instead of flowers took first place.

One interesting exhibit was concerned with the conservation of grass in silos. Different types of silos, one of concrete and the other of wood, were constructed, these being of special interest to grassland and dairy farmers.

* * *

Packing for the Export Trade

The following letter has been sent to Secretaries of all Export Groups:

SIR,

Increasing attention is being devoted to Export Trade, and I have been asked by the members of this Association to communicate with you in regard to fibreboard packing-cases. The advantages of corrugated and solid fibreboard containers are well known and no trouble should be experienced if the packer consults a reputable fibreboard firm and uses a properly designed box.

I would be very much obliged if you could draw the attention of your members to the fact that this Association is at their service to deal with any queries or complaints that may arise.

Membership of this Association is restricted to fibreboard packing-case manufacturers who combine the board components prior to manufacturing the cases, and they are therefore in a position to give advice on the question of raw materials as well as on the design and construction of the case. Any of the members of this Association may be approached with the assurance that enquiries will be dealt with by those properly qualified to give advice on packing questions.

Yours faithfully,

(*Signed*) WILLIAM EADIE,

For the Secretary of the Fibreboard Packing-case Manufacturers' Association.

5, CHANCERY LANE, W.C.2.

* * *

Obituary

A link with one of Glasgow's oldest flour mills, which have associations dating back to the sixteenth century, has been severed by the death of Mr. William Wallace White. Until they were acquired in 1932 by Spillers, Ltd., Mr. White was a director of the Scotstoun Flour Mills, Partick, Glasgow, the site of which has been continuously associated with milling since 1587.

The White family were well known in the Partick district for many years, and began their association with the Scotstoun Mills in 1834, and Mr. William W. White was a grandson of the founder of the firm which ultimately came to be known as John White and Sons (Glasgow), Ltd., from which the mills were acquired by Messrs. Spillers. The cereal side of that concern was continued by Messrs. Matthew White, Jun., and Company.

Mr. White, who was unmarried, is survived by two sisters.

* * *

Machinery Licensing Appointment

The President of the Board of Trade has appointed Mr. R. Hugh Roberts to be Director of Machinery Licensing. Mr. Roberts, who was formerly Deputy Director-General of Equipment and Stores, Ministry of Supply, will be responsible for the licensing of machinery and plant under the Machinery and Plant (Control) (No. 2) Order, 1940. His office is at 25, Southampton Buildings, Chancery Lane, London, W.C. 2.

FOOD MEN IN H.M. FORCES

G. M. Rowan

Captain G. M. Rowan, Royal Artillery, who has been killed as the result of enemy action, was the second son of Mr. and Mrs. R. Houston Rowan, 22, Esplanade, Greenock. Captain Rowan was with his unit in the evacuation from Dunkirk, and had since been stationed in the South of England. It is learned that he was killed when his car was hit by a bomb as he was returning from duty.

Aged 24 years, Captain Rowan served his apprenticeship in the sugar-refining business with Messrs. John Walker and Co., Greenock, and was with Messrs. Tate and Lyle, London, when he was called up as a Territorial at the outbreak of war. His brother is also serving in the Royal Artillery.

Alan F. Duncan

It has been reported that Mr. Alan F. Duncan, who was well known as a salesman and traveller in the Heinz organisation in the North of Scotland, is a prisoner of war. A second-lieutenant in the Royal Engineers, he went to France in January and was reported "Missing" on June 21.

Food Equipment for Bombay

It is stated by the Department of Overseas Trade that in Bombay there are possibilities of business in mincing, coffee grinding and ice-cream freezing machines which have formerly been imported from Sweden and Germany. Stocks of such machines have been greatly reduced and have been sold locally at prices about 90 per cent. higher than pre-war.

* * *

Foreign Trade Commission

The Bureau of Foreign Trade of the Ministry of Industry in Shanghai was incorporated into the Research Department of the Foreign Trade Commission in 1938.

The Chief of the Research Department, Mr. Cato Young, advises us that it is a matter of regret that owing to the repercussions of the Sino-Japanese war and frequent removals, the publication of the *Chinese Economic Journal* by the erstwhile Bureau of Foreign Trade has had to be suspended since the outbreak of hostilities. It is planned, however, shortly to resume the issue of this periodical.

The address for correspondence is: Research Department, Foreign Trade Commission, South Bank, Chungking, China.

* * *

Watchman's Control Clock

Wherever a watchman is employed it is possible to keep a check of his movements by synchromatic control. With the Synchromatic Perpetual Control Clock a watchman's rounds may be made and marked as often as desired. Examination of the records, renewal of paper strip and ink ribbon occupies a few seconds, and, the ribbon moving automatically, assures perfect records.

This clock is adapted to control any number of stations, and these may be multiplied according to need, the only addition necessary being station keys. The clock indicates the time and figures to the watchman.

This equipment is made by the Synchromatic Time Recording Co., Ltd., who also have A.R.P. equipment, including bomb outfits, anti-gas clothing, gas masks, stirrup pumps, etc.

* * *

Batchelor's Peas

The fourth annual general meeting of Batchelor's Peas, Ltd., was recently held at Sheffield.

Mrs. E. H. Gasking (the chairman) said that the trading profit for the year amounted to £103,999, compared with £101,367 in the previous year, and the net profit was £109,009, as compared with £87,166. When war broke out the directors had decided that they must keep two objects in view: to maintain the goodwill of the company by fair and reasonable treatment of all customers and to help in the prosecution of the war by keeping prices as low as possible. It would have been very easy to exploit the situation and to make much larger profits, but by adopting the policy mentioned the goodwill between their customers and the company was better than it had ever been, and their prestige in the trade was something to be proud of. The satisfactory increase in profits was entirely due to a very large increase in turnover.

They had considered it imperative to work at high pressure to ensure as heavy a pack as possible of English fresh fruits and vegetables, and the severe winter conditions had made their products a most useful addition to the nation's larder. They would continue to work at full pressure as long as supplies were available. While their main product had always been canned peas, they were now in a position to can any type of fruit and vegetable.

They could not tell what was in store for them, but she felt that with their available resources and a little ingenuity they should be able to contribute a good share towards the producing and preservation of the nation's food supply.

The report was adopted, and the proposed dividend of 15 per cent., less tax, was approved.

INFORMATION AND ADVICE

Sauerkraut—Canned Roes—Lemon Curd—Corned Beef and Salted Tongues—Processing Meat Paste—Soya Milk—Information Supplied

Sauerkraut

6,591. *Will you please give us some information for manufacturing sauerkraut?*

The quality of the sauerkraut depends especially on the variety of cabbage used and the machinery for shredding. Good sauerkraut should be firm, long and white. The cabbage being shredded is weighed and put in clean barrels, pressed down tightly with a wide piece of wood as each layer is put in. On each layer add the salt in the proportion of 2½ lbs. per 100 lbs. cabbage, adding also a few juniper berries. When the barrel is full place the bottom board on the cabbage and keep pressed down by a weight or screw press, if the barrel has been specially built for this purpose.

In a few days the water secreted by the cabbage will cover the boards and will constitute the brine in which fermentation takes place.

This is a very brief description of the process, and other writers go fully into fermentation problems, etc., etc. Campbell's book gives a very full description, which we are unable to transcribe here.

Canned Roes

6,617. *I require details of the method of canning cod roe and soft herring roe, and would greatly appreciate it if you could forward me the information.*

The following are some general instructions:

"The roe is thoroughly washed in brine to remove the blood. In some places the roe is minced, and when filled into the can a sufficient amount of brine is added to give the proper consistency to the finished product. In other parts the roe is kept whole, or as nearly whole as possible. Packing is most often in the No. 2 can. Brine, oil, or sauce is added. Processing should be about 60 minutes at 240° F."

Moisture, etc., Content of Lemon Curd

6,612. *Will you kindly inform me how moisture, fat, starch, cane and invert sugar can be determined in cheap commercial lemon curd?*

We would point out that such determinations require skilled analytical procedure. To describe this would need a volume, and we recommend that you acquire an analytical textbook, which we should be pleased to obtain for you.

Should you merely need the analysis of one sample, we suggest that you send it to an analyst, and could give you the name of one.

Corned Beef and Salted Tongues

6,514. *We shall be glad if you will supply us with information as to how to manufacture corned beef and salted tongues on a large scale.*

This is a very large subject and cannot be covered within the scope of these columns. We suggest that you get in touch with an expert (name given).

Processing Meat Paste

6,499. *We propose to pack in glass jars a meat paste containing 40 to 50 per cent. meat, and should be pleased to have your views on the process or processes entailed.*

Considering the size of the glasses (12¾ fluid oz. diameter, 2⅞ inches by 4⅜ inches high or 6½ fluid oz. diameter, 2⅜ inches by 3 inches high) we should like to know the time these glasses should be in the retorts—i.e., *after the steam is turned on, what time should be allowed to bring the filled glasses in the retorts up to temperature, and after reaching this temperature, how long should this temperature, whatever it may be, be held?*

A note of the preferred type of closures for these sizes of glasses would also be very helpful.

Failing standard figures for sterilisation times for the pack mentioned, we put our enquirer into touch with laboratories prepared to make the tests.

A suitable type of closure was suggested.

Soya Milk

6,592. *In your issue for February, 1939, your article "The Soya Bean" referred to the production of Soya milk, which has the same appearance and properties as animal milk. Are there any manufacturers of this product in this country? Is the product available as a dried powder? Please give us sources of supply.*

To the best of our knowledge there are no manufacturers of soya milk in this country. We believe that it is marketed in the U.S.A. in liquid form, but even there is not obtainable as dried powder. We suggest that you get in touch with a firm who for many years have been interested in soya products and might be able to help you (name given).

Information Supplied

6,489. *We have received an enquiry for the supply of custard powder, etc., in 7-lb. paper lined linen bags.*

As we are not accustomed to packing in this manner, we shall be very much obliged if you can put us in touch with a manufacturer of these linen bags.

Names of manufacturers supplied.

6,521. *We are interested in obtaining information regarding the following automatic or semi-automatic machines for:*

1. *Making paper and cardboard cartons and small boxes.*
2. *Making such cartons and filling them with grains, powders, sugar, or other small materials; preferably with self-contained weighing and checking equipment.*
3. *Similar to the above, but arranged to check volume instead of weight.*
4. *Filling bottles, by volume or weight of contents.*
5. *Same for filling tins.*
6. *Stapling wire-stitching boxes and cartons.*

Names and addresses of various manufacturers given.

6,525. *We desire to know the name and address of an English manufacturer of a machine for producing alimentary paste (macaroni, spaghetti, vermicelli, noodles, etc.).*

Names of a variety of firms were supplied.

6,526. *We should be obliged if you would be good enough to give us the names and addresses of some suppliers of fruit pulps.*

Information given.

6,452. *Please send names and addresses of the suppliers of Gum Karaya.*

Names given.

6,368. *In your issue of March 1 you have an article on Propionic Acid, extracted from a paper presented by Mr. Frederick W. Miller at the second Food Technology Conference.*

We shall be glad to know whether this acid or its compounds are obtainable in this country on a commercial basis.

Names of suppliers given.

6,418. *We shall be glad to know whether you can put us in touch with any manufacturer who is making an automatic butter moulding and wrapping machine in this country.*

We know of no manufacturer in this country, but name of Swiss manufacturer given.

6,385. *We have been endeavouring to secure two apple peeling and coring machines for the coming season. Can you assist us in securing the machines required?*

Names of manufacturers supplied.

6,559. *We are interested in the mono- and di-glycerides mentioned in your July issue.*

Could you please forward the address of the respective manufacturers of similar emulsifying agents.

Information supplied.

RECENT PATENTS, TRADE MARKS AND NEW COMPANIES

Due to extreme pressure on space these have been unavoidably held over until next month.